USDA United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with North Carolina Department of Environment, Health, and Natural Resources; North Carolina Agricultural Research Service; North Carolina Cooperative Extension Service; Polk Soil and Water Conservation District; and Polk County Board of Commissioners

Soil Survey of Polk County, North Carolina

How To Use This Soil Survey

General Soil Map

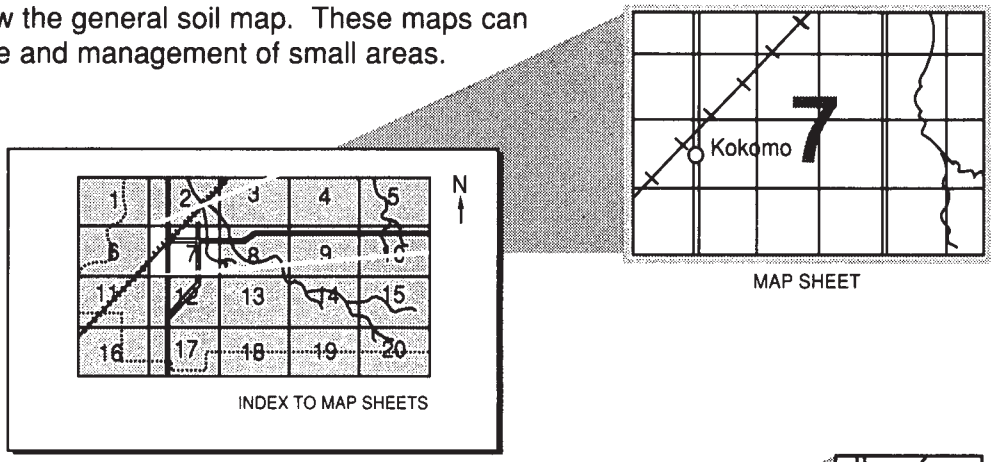
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

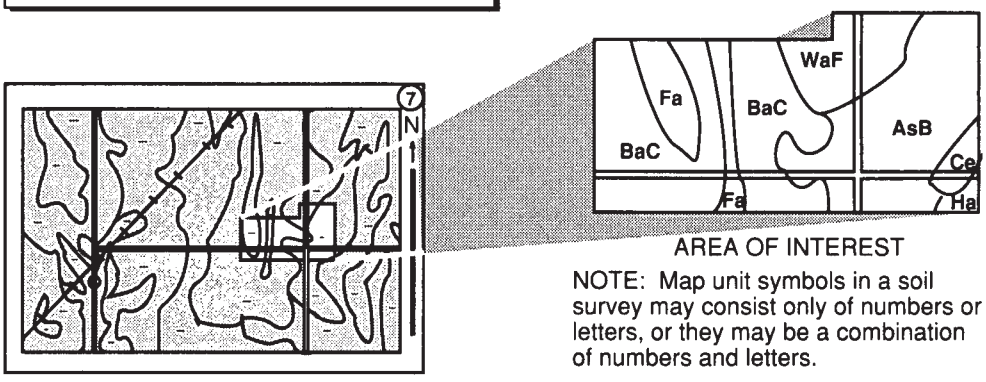
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



INDEX TO MAP SHEETS

MAP SHEET

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET

AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the North Carolina Agricultural Research Service, and local agencies. The Natural Resources Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1991. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1992. This soil survey was made cooperatively by the Natural Resources Conservation Service; the North Carolina Department of Environment, Health, and Natural Resources; the North Carolina Agricultural Research Service; the North Carolina Cooperative Extension Service; the Polk Soil and Water Conservation District; and the Polk County Board of Commissioners. The survey is part of the technical assistance furnished to the Polk Soil and Water Conservation District. The Polk County Board of Commissioners provided financial assistance for the survey.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: Areas of piedmont upland soils, such as these Pacolet and Madison soils, are commonly used as hayland. Fannin and Cowee soils are in the background. They are the dominant soils at the higher elevations on forested mountains.

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Issued 1998

Index to Map Units

Summary of Tables

Foreword

This soil survey contains information that affects land use planning in Polk County. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various decisions for land use or land treatment. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the North Carolina Cooperative Extension Service.

Richard A. Gallo
State Conservationist
Natural Resources Conservation Service

Soil Survey of
Polk County, North Carolina

By Scott C. Keenan, North Carolina Department of Environment, Health, and Natural Resources

Soils surveyed by Scott C. Keenan, North Carolina Department of Environment, Health, and Natural Resources, and Steven T. Evans, J. Craig Harris, and L. Lee Mallard, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
North Carolina Department of Environment, Health, and Natural Resources; North Carolina Agricultural Research Service; North Carolina Cooperative Extension Service; Polk Soil and Water Conservation District; and Polk County Board of Commissioners

Polk County is in the southwestern part of North Carolina (fig. 1). In 1990, the county had a population of 14,416. Columbus, the county seat, had a population of 812. Tryon, the largest town in the county, had a population of 1,680 *(23)*.

This survey updates the first soil survey of Polk County published in 1923 *(15)*. It provides more detailed maps on aerial photographs and contains more interpretive information.

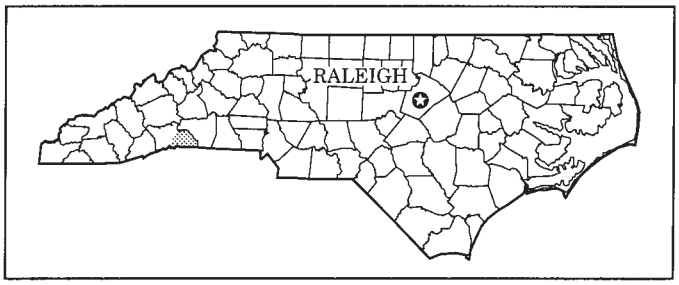

Figure 1.—Location of Polk County in North Carolina.

General Nature of the County

This section gives general information about Polk County. It describes the history and development; topography, relief, and drainage; and climate.

History and Development

The Polk County Historical Association helped prepare this section.

Polk County was named to honor Colonel William Polk, a Revolutionary War hero. Official county status was granted in 1855 after Columbus was selected as the county seat. Prior to European settlement, the survey area was part of the original territorial claim of the Cherokee Indian Nation. Trappers and fur traders arrived in the area in the mid-1700's. Later, King George III offered land grants to encourage permanent settlements.

The economy of the early settlements was based mainly on hardwood timber and agriculture. Cotton had become the main cash crop by 1850. About this time, a small gold mine was in operation near Collinsville. By 1878, Polk County had railroad access to Asheville and to South Carolina by way of Tryon and Saluda. The railroad opened new markets, making apple and peach production more profitable and encouraging the start of the textile and tourist industries. The completion of U.S. Interstate 26 in 1976 marked the start of the most recent era of economic growth in Polk County *(14)*.

Today, the textile industry remains an important part of the economy of Polk County and a major full-time employer of county residents. Agriculture in the county has become increasingly diversified. The major row crops

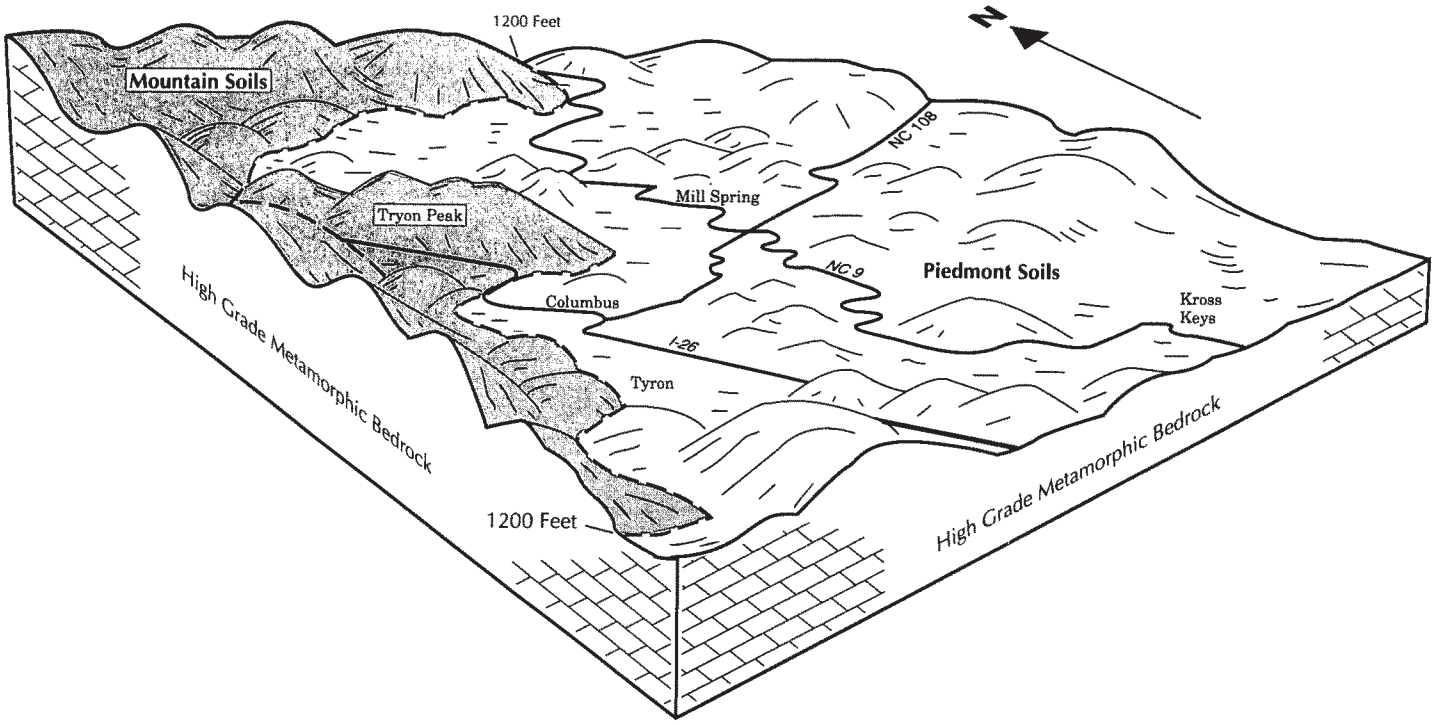

Figure 2.—About 70 percent of the land area in Polk County is in the Piedmont Physiographic Region, and about 30 percent is in the Mountain Physiographic Region.

are corn, small grain, and soybeans. Vegetable crops include tomatoes, squash, and cucumbers. Areas of pasture and hayland and managed pine plantations are common throughout the Piedmont area.

The tourist industry in Polk County continues to benefit from the mountain scenery, the mild climate, and access to the U.S. Interstate. The county is also in a part of the state that is popular for retirement living.

Topography, Relief, and Drainage

Polk County is drained by the Green River, the North Pacolet River, and numerous creeks that form their tributaries. Drainage is generally from northwest to southeast. Some areas in the western part of the county are drained southwest to northeast.

According to U.S. Geological Survey topographic maps, the highest elevation in Polk County is Wildcat Spur, located in the northwestern part of the county. It is about 3,180 feet above sea level. The lowest elevation is about 720 feet, located in the southeastern corner of the county along the Green River.

The landscapes in Polk County can be divided into three groups. They are the piedmont and mountain uplands, the mountain coves and hill slopes, and the flood plains and stream terraces. The piedmont landscapes and soils occur in the central and eastern parts of the county, at elevations generally below 1,200 feet. The mountain landscapes and soils are in the western part of the county, at elevations above 1,200 feet.

About 61 percent of the soils in Polk County are on piedmont uplands and have slopes ranging from gently sloping to steep. Nearly 26 percent of the soils in the county are on mountain uplands (fig. 2). They are predominantly moderately steep to very steep, but a small percentage of these soils is strongly sloping.

The soils in mountain coves and on hill slopes dominantly have extremely stony or extremely bouldery surfaces and are strongly sloping to steep. In a few areas, these soils do not have stones or boulders on the surface. The soils in mountain coves and on foot slopes make up about 3 percent of the county.

The nearly level or gently sloping soils on flood plains and stream terraces make up about 6 percent of the county. Most areas of these soils are in the Piedmont, adjacent to the major creeks and rivers in the southern and eastern parts of the county.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Tryon, North Carolina, in

the period 1948 to 1993. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 44 degrees F and the average daily minimum temperature is 32 degrees. The lowest temperature on record, which occurred on January 21, 1985, is -8 degrees. In summer, the average temperature is 76 degrees and the average daily maximum temperature is 87 degrees. The highest recorded temperature, which occurred on June 22, 1964, is 105 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total average annual precipitation is about 65 inches. Of this, 34 inches, or about 53 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 16 inches. The heaviest 1-day rainfall during the period of record was 6.85 inches on August 18, 1986. Thunderstorms occur on about 45 days each year.

The average seasonal snowfall is about 8 inches. The greatest snow depth at any one time during the period of record was 16 inches. On the average, 4 days of the year have at least 1 inch of snow on the ground. The number of such days varies from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 90 percent. The sun shines 60 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the northwest. Average windspeed is highest, 10 miles per hour, in winter.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify the soils. After describing the soils and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area are generally collected for laboratory analyses and for engineering tests. The data from these analyses and tests and from field-observed characteristics and soil properties are used to predict behavior of the soils under different uses. Interpretations are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data

are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a relatively high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in accurately locating boundaries.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

Survey Procedures

The general procedures followed in making this survey are described in the "National Soil Survey Handbook" of the Natural Resources Conservation Service and in the "Soil Survey Manual" *(17, 22)*.

Before fieldwork began, preliminary boundaries of slopes and landforms were plotted stereoscopically on aerial photographs taken in 1985 at a scale of 1:24,000. United States Geological Survey topographic maps at a scale of 1:24,000 were also used. Map units were then designed according to the pattern of soils interpreted from photographs, maps, and field observations.

Traverses were made on foot. The soils were examined at intervals ranging from a few hundred feet to as much as 1/4 mile, depending on the landscape and soil pattern. Where soil profiles were readily observable, such as along recently constructed access roads and along logging roads, observations of the content of rock fragments, depth to bedrock, depth of rooting, the landform, and the underlying material were made without regard to spacing. Observations of special features, such as landforms, vegetation, and evidence of flooding, were made continuously without regard to spacing.

Soil boundaries were determined on the basis of soil examinations, observations, and photo interpretations. The soils were examined with the aid of a bucket auger or a spade to a depth of about 3 to 5 feet. Soil boundaries were plotted stereoscopically on the basis of parent material, landform, and relief.

Samples for chemical and physical analyses were taken from the site of the typical pedon of the major soils in the survey area. Most of the analyses were made by the Soil Survey Laboratory, Lincoln, Nebraska, by the Soil Mechanics Laboratory, Fort Worth, Texas, and by the North Carolina State University Soils Laboratory, Raleigh, North Carolina. Commonly used laboratory procedures were followed *(20)*. The results of the analyses of selected soils are given in table 16.

After completion of the soil mapping on aerial photographs, map unit delineations were transferred by hand to orthophotographs at a scale of 1:24,000. Surface drainage and cultural features were transferred from 7.5-minute topographic maps of the United States Geological Survey.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils and some minor soils or miscellaneous areas. It is named for the major soils. The components of one map unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or a building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Gently Sloping to Steep, Well Drained Soils; on Piedmont Uplands

The map units of this group make up about 65 percent of Polk County. They are on ridges and hill slopes at elevations below 1,200 feet. The major uses are woodland and pasture and hayland. Other uses include cropland, orchards, and urban development.

1. Pacolet-Madison-Rion

Strongly sloping to steep, very deep soils that have a predominantly clayey or loamy subsoil; formed in residuum weathered mainly from high-grade metamorphic rocks, such as biotite gneiss, porphyroblastic gneiss, and migmatitic gneiss

Setting

Location in the survey area: Central and eastern parts of the county at elevations below 1,200 feet
Landscape: Piedmont uplands
Landform: Pacolet and Madison—ridges and hill slopes; Rion—hill slopes
Slope range: 8 to 45 percent

Extent and Composition (fig. 3)

Percent of the survey area: 45 percent
Pacolet soils—33 percent
Madison soils—25 percent
Rion soils—18 percent
Minor soils—24 percent (including Grover, Cecil, Hiwassee, Dogue, Ashlar, and Chewacla soils)

Soil Characteristics

Pacolet

Surface layer: Brown sandy clay loam
Subsoil: Upper part—red clay; middle part—red clay loam; lower part—red sandy clay loam
Underlying material: Saprolite consisting of fine sandy loam in shades of red, yellow, or brown
Depth class: Very deep
Drainage class: Well drained
Depth to high water table: More than 6 feet
Slope range: 8 to 25 percent
Parent material: Residuum that weathered mainly from high-grade metamorphic rocks, such as biotite gneiss, porphyroblastic gneiss, and migmatitic gneiss

Madison

Surface layer: Brown sandy clay loam
Subsoil: Upper part—red clay; lower part—red clay loam
Underlying material: Saprolite consisting of coarse sandy loam in shades of red, yellow, or brown that has a high content of mica
Depth class: Very deep
Drainage class: Well drained
Depth to high water table: More than 6 feet
Slope range: 8 to 25 percent
Parent material: Residuum that weathered mainly from high-grade metamorphic rock, such as migmatitic gneiss that has a high content of mica

Rion

Surface layer: Yellowish brown sandy loam
Subsoil: Upper part—strong brown sandy clay loam; middle part—yellowish red clay loam; lower part—strong brown sandy clay loam that has pockets of clay loam

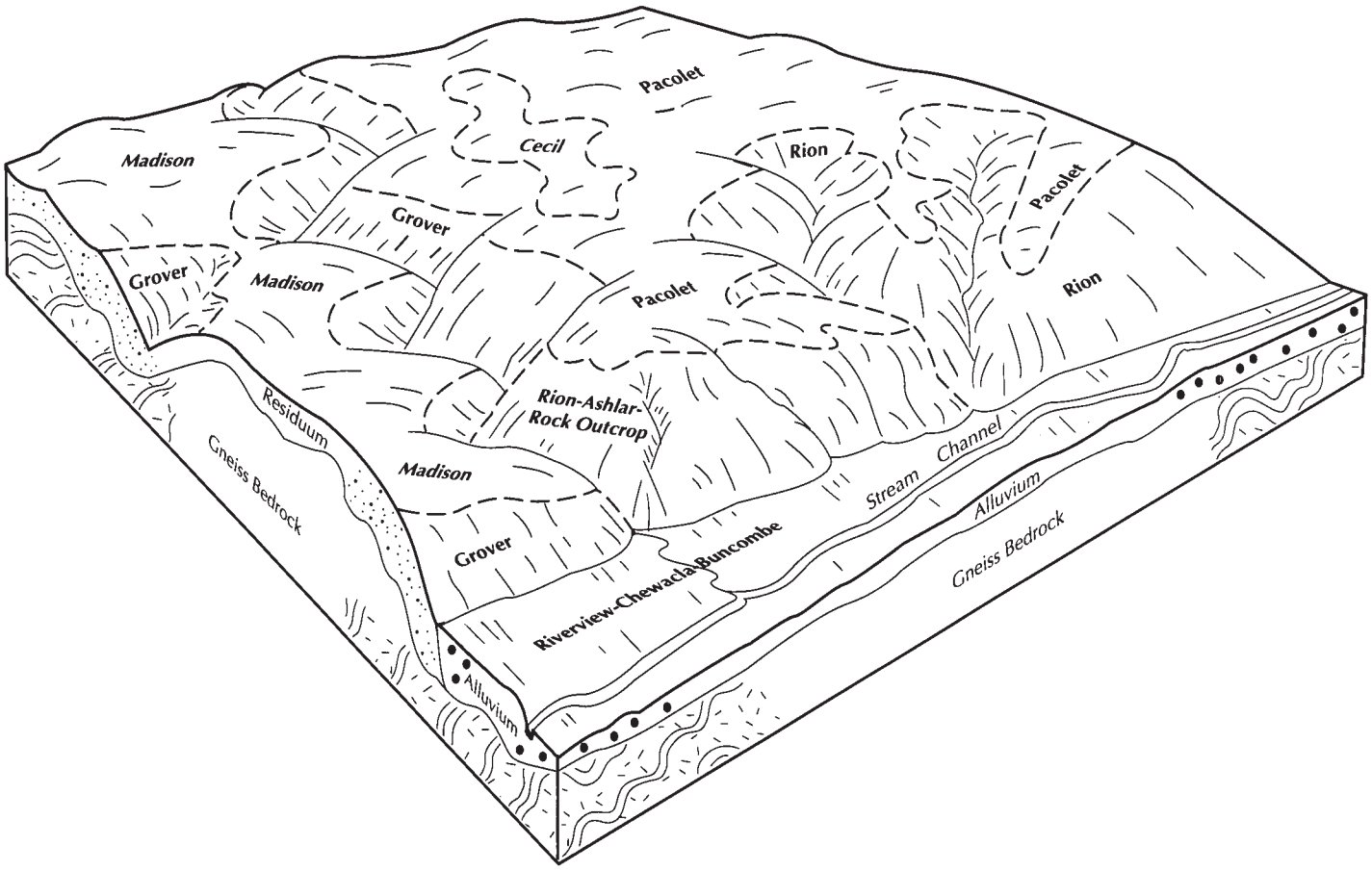

Figure 3.—The relationship between soils, landscape, and parent material in the Pacolet-Madison-Rion general soil map unit. The clayey Pacolet, Madison, and Cecil soils occur on ridgetops. The loamy Rion, Grover, and Ashlar soils are on the adjacent side slopes.

Underlying material: Saprolite consisting of strong brown sandy loam that has yellowish red mottles
Depth class: Very deep
Drainage class: Well drained
Depth to high water table: More than 6 feet
Slope range: 25 to 45 percent
Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rocks, such as biotite gneiss, porphyroblastic gneiss, and migmatitic gneiss

Minor soils

- Grover soils that have a higher content of mica than the major soils and are in similar landform positions
- Cecil soils that have a subsoil that is thicker than that of the major soils and that are on broad, gently sloping ridges
- Hiwassee soils that have a subsoil that is thicker than that of the major soils and that are on similar landscapes or on gently sloping stream terraces
- The moderately well drained Dogue soils on gently sloping stream terraces near drainageways
- The somewhat poorly drained Chewacla soils on nearly level flood plains
- The moderately deep Ashlar soils

Use and Management

Major Uses: Woodland, pasture and hayland, cropland, orchards, and dwellings

Agricultural Development

Cropland

Management concerns: Pacolet and Madison—erodibility, equipment use, tilth, and fertility; Rion—slope

Pasture and hayland

Management concerns: Erodibility and equipment use

Woodland

Management concerns: Pacolet and Madison—equipment use, erodibility, and seedling survival; Rion—equipment use and erodibility

Urban Development

Dwellings

Management concerns: Pacolet and Rion—slope; Madison—slope and a very severe hazard of erosion for the underlying material

Septic tank absorption fields

Management concerns: Pacolet and Madison—restricted permeability and slope; Rion—slope

Local roads and streets

Management concerns: Pacolet—low strength and slope; Madison—low strength, slope, and a very severe hazard of erosion for the underlying material; Rion—slope

2. Cecil-Pacolet

Gently sloping and strongly sloping, very deep soils that have a predominantly clayey subsoil; formed in residuum weathered mainly from high-grade metamorphic rock, such as biotite gneiss

Setting

Location in the survey area: Southeastern part of the county at elevations below 1,200 feet
Landscape: Piedmont uplands
Landform: Cecil—broad ridges; Pacolet—hill slopes
Slope range: 2 to 15 percent

Extent and Composition

Percent of the survey area: 11 percent
Cecil soils—57 percent
Pacolet soils—33 percent
Minor soils—10 percent (including Dogue, Appling, Chewacla, and Hiwassee soils)

Soil Characteristics

Cecil

Surface layer: Strong brown sandy clay loam
Subsoil: Upper part—red clay; middle part—red clay that has yellowish red mottles; lower part—yellowish red clay loam that has strong brown mottles
Depth class: Very deep
Drainage class: Well drained
Depth to high water table: More than 6 feet
Slope range: 2 to 8 percent
Parent material: Residuum that weathered mainly from high-grade metamorphic rock, such as biotite gneiss

Pacolet

Surface layer: Brown sandy clay loam
Subsoil: Upper part—red clay; middle part—red clay loam; lower part—red sandy clay loam
Underlying material: Saprolite consisting of fine sandy loam in shades of red, yellow, or brown
Depth class: Very deep
Drainage class: Well drained
Depth to high water table: More than 6 feet
Slope range: 8 to 15 percent
Parent material: Residuum that weathered mainly from high-grade metamorphic rock, such as biotite gneiss

Minor soils

- The moderately well drained Dogue soils on gently sloping stream terraces near drainageways
- The somewhat poorly drained Chewacla soils on nearly level flood plains
- Appling soils that have a subsoil that is thicker than that of the major soils and that are in similar landform positions
- Hiwassee soils that have a subsoil that is thicker than that of the major soils and that are on similar landscapes or on gently sloping stream terraces

Use and Management

Major Uses: Cropland, pasture and hayland, woodland, orchards, and urban development

Agricultural Development

Cropland

Management concerns: Erodibility, tilth, and fertility

Pasture and hayland

Management concerns: Cecil—erodibility; Pacolet—erodibility and equipment use

Woodland

Management concerns: Equipment use and seedling survival

Urban Development

Dwellings

Management concerns: Cecil—no significant limitations; Pacolet—slope

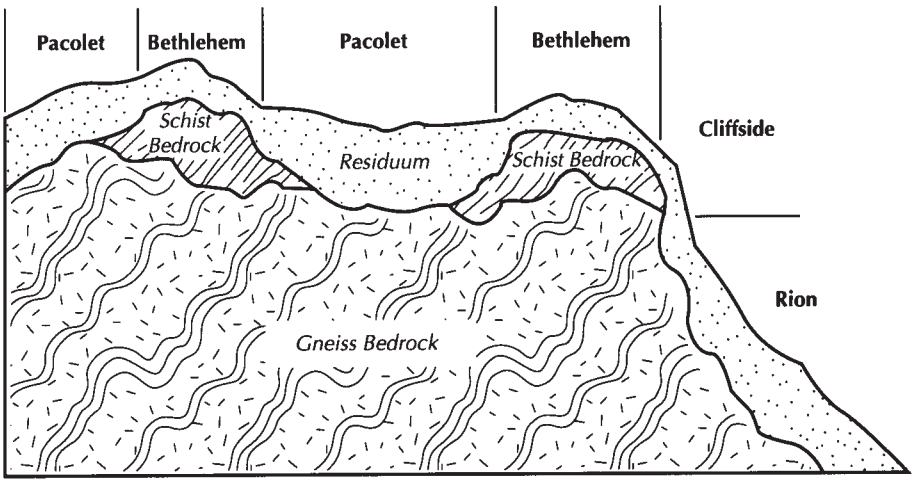

Figure 4.—The relationship between soils, landscape, and parent material in the Pacolet-Bethlehem-Rion general soil map unit. The moderately deep Bethlehem and Cliffside soils are in convex landscape positions. They formed in residuum derived from schist bedrock. The very deep Pacolet and Rion soils are in concave landscape positions. They formed in residuum derived from schist or gneiss bedrock.

Septic tank absorption fields

Management concerns: Cecil—restricted permeability; Pacolet—restricted permeability and slope

Local roads and streets

Management concerns: Cecil—low strength; Pacolet—low strength and slope

3. Pacolet-Bethlehem-Rion

Strongly sloping to steep, very deep and moderately deep soils that have a predominantly clayey or loamy subsoil; formed in residuum weathered mainly from high-grade metamorphic rocks, such as biotite gneiss and sillimanite-mica schist

Setting

Location in the survey area: Northeastern and southern parts of the county at elevations below 1,200 feet
Landscape: Piedmont uplands
Landform: Pacolet and Bethlehem—ridges and hill slopes; Rion—hill slopes
Slope range: 8 to 45 percent

Extent and Composition (fig. 4)

Percent of the survey area: 9 percent
Pacolet soils—46 percent
Bethlehem soils—28 percent
Rion soils—17 percent
Minor soils—9 percent (including Cliffside, Grover, Cecil, and Chewacla soils)

Soil Characteristics

Pacolet

Surface layer: Brown sandy clay loam
Subsoil: Upper part—red clay; middle part—red clay loam; lower part—red sandy clay loam
Underlying material: Saprolite consisting of fine sandy loam in shades of red, yellow, or brown
Depth class: Very deep
Drainage class: Well drained
Depth to high water table: More than 6 feet
Slope class: 8 to 25 percent
Parent material: Residuum that weathered mainly from high-grade metamorphic rocks, such as biotite gneiss and sillimanite-mica schist

Bethlehem

Surface layer: Strong brown gravelly coarse sandy loam
Subsoil: Upper part—yellowish red clay loam; middle part—red clay; lower part—red gravelly clay
Bedrock: Soft, weathered sillimanite-mica schist bedrock
Depth class: Moderately deep
Drainage class: Well drained
Depth to high water table: More than 6 feet
Slope class: 8 to 25 percent
Parent material: Residuum that weathered mainly from high-grade metamorphic rock, such as sillimanite-mica schist

Rion

Surface layer: Yellowish brown sandy loam
Subsoil: Upper part—strong brown sandy clay loam; middle part—yellowish red clay loam; lower part—strong brown sandy clay loam that has pockets of clay loam
Underlying material: Saprolite consisting of strong brown sandy loam that has yellowish red mottles
Depth class: Very deep
Drainage class: Well drained
Depth to high water table: More than 6 feet
Slope class: 25 to 45 percent
Parent material: Residuum that weathered mainly from high-grade metamorphic rock, such as biotite gneiss

Minor soils

• Cliffside soils that have hard bedrock within a depth of 40 inches and that are in landform positions similar to those of the major soils
• Grover soils that have a higher content of mica than the major soils and that are in similar landform positions
• Cecil soils that have a subsoil that is thicker than that of the major soils and that are on broad, gently sloping ridges
• The somewhat poorly drained Chewacla soils on nearly level flood plains

Use and Management

Major Uses: Woodland, dwellings, pasture and hayland, orchards, and cropland

Agricultural Development

Cropland

Management concerns: Pacolet and Bethlehem—erodibility, equipment use, tilth, and fertility; Rion—slope

Pasture and hayland

Management concerns: Erodibility and equipment use

Woodland

Management concerns: Pacolet—equipment use, erodibility, and seedling survival; Bethlehem—equipment use, erodibility, hazard of windthrow, and seedling survival; Rion—equipment use and erodibility

Urban Development

Dwellings

Management concerns: Pacolet and Rion—slope; Bethlehem—slope and depth to bedrock

Septic tank absorption fields

Management concerns: Pacolet—restricted permeability and slope; Bethlehem—restricted permeability, depth to bedrock, and slope; Rion—slope

Local roads and streets

Management concerns: Pacolet and Bethlehem—low strength and slope; Rion—slope

Nearly Level and Gently Sloping, Somewhat Poorly Drained to Excessively Drained Soils; on Flood Plains

The map unit in this group makes up about 4 percent of Polk County. It consists of occasionally flooded soils. It is on flood plains adjacent to major creeks and rivers at elevations below 1,200 feet. The major uses are cropland, pasture and hayland, and woodland.

4. Riverview-Chewacla-Buncombe

Nearly level and gently sloping, very deep soils that have a loamy subsoil or predominantly sandy underlying material; formed in recent alluvium derived from mixed geologic sources

Setting

Location in the survey area: Areas adjacent to major creeks and rivers at elevations below 1,200 feet
Landscape: Piedmont valleys
Landform: Flood plains
Slope range: 0 to 5 percent

Extent and Composition (fig. 5)

Percent of the survey area: 4 percent
Riverview soils—25 percent
Chewacla soils—23 percent
Buncombe soils—20 percent
Minor soils—32 percent (including Skyuka, Dogue, Masada, Roanoke, and Wehadkee soils and Udorthents)

Soil Characteristics

Riverview

Surface layer: Dark brown loam
Subsoil: Upper part—dark yellowish brown clay loam; middle part—dark yellowish brown loam; lower part—dark yellowish brown loam that has yellowish brown mottles
Depth class: Very deep
Drainage class: Well drained
Depth to high water table: 3.0 to 5.0 feet

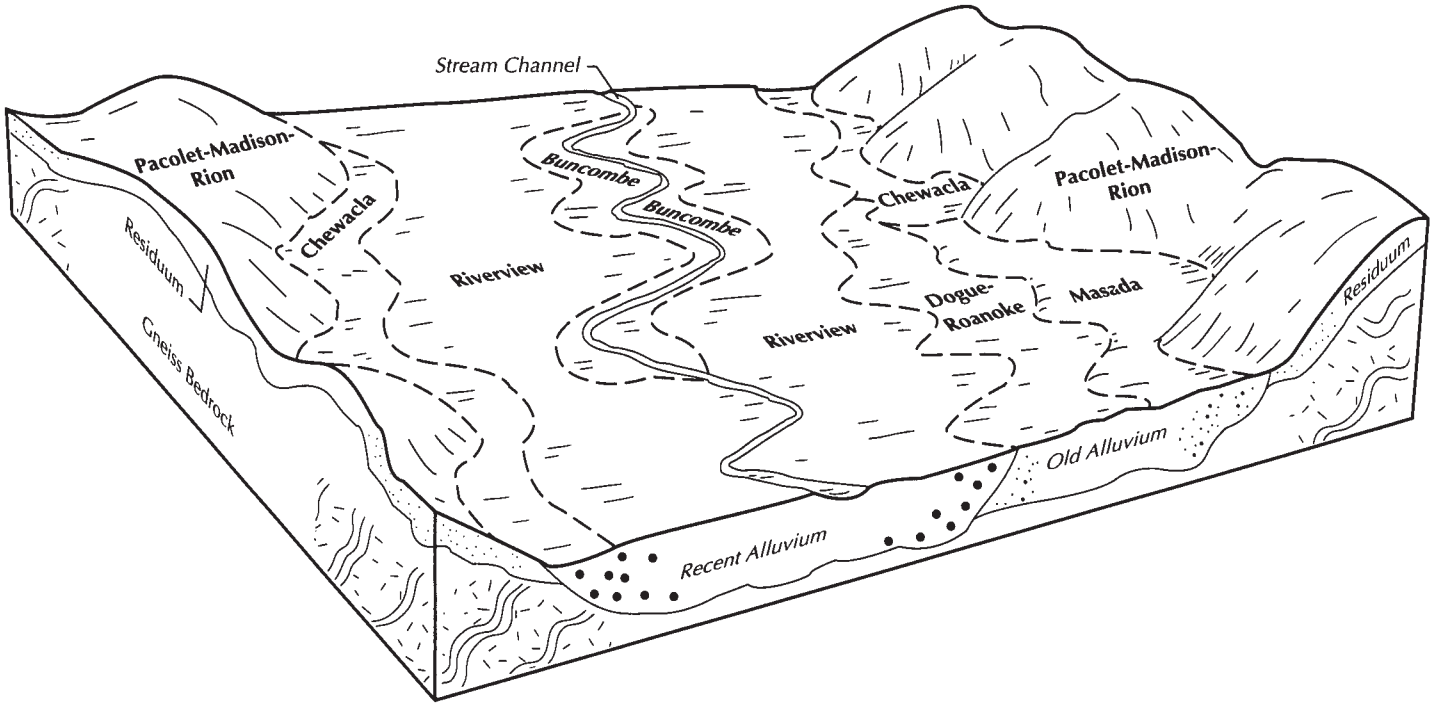

Figure 5.—The relationship between soils, landscape, and parent material in the Riverview-Chewacla-Buncombe general soil map unit. The Buncombe soils are in convex areas adjacent to the stream channel; the Chewacla soils are in the lower, concave areas further from the channel; and the Riverview soils occur in the remaining areas of the flood plain. The clayey Masada, Dogue, and Roanoke soils are on the higher stream terraces.

Flooding: Occasional
Slope class: 0 to 2 percent
Parent material: Recent alluvium derived from mixed geologic sources

Chewacla

Surface layer: Dark brown loam
Subsoil: Upper part—brown loam that has light brown mottles; lower part—dark brown loam that has dark gray mottles
Underlying material: Upper part—gray silty clay loam that has yellowish brown mottles; lower part—gray silty clay loam that has dark reddish brown mottles
Depth class: Very deep
Drainage class: Somewhat poorly drained
Depth to high water table: 0.5 foot to 1.5 feet
Flooding: Occasional
Slope class: 0 to 2 percent
Parent material: Recent alluvium derived from mixed geologic sources

Buncombe

Surface layer: Dark yellowish brown loamy sand
Underlying material: Upper part—yellowish brown sand; middle part—light yellowish brown and brown sand; lower part—pale brown sand
Depth class: Very deep
Drainage class: Excessively drained
Depth to high water table: More than 6 feet
Flooding: Occasional
Slope class: 0 to 5 percent
Parent material: Recent alluvium derived from mixed geologic sources

Minor soils

- The clayey, well drained Skyuka and Masada soils on gently sloping stream terraces
- The clayey, moderately well drained Dogue soils on gently sloping stream terraces
- The poorly drained Wehadkee soils in landform positions that are similar to those of the major soils
- Randomly scattered areas of Udorthents
- The poorly drained Roanoke soils on gently sloping stream terraces

Use and Management

Major Uses: Cropland, pasture and hayland, and woodland

Agricultural Development

Cropland

Management concerns: Riverview—flooding; Chewacla—flooding and wetness; Buncombe—flooding, droughtiness, and leaching of nutrients

Pasture and hayland

Management concerns: Riverview—flooding; Chewacla—flooding and wetness; Buncombe—flooding, droughtiness, and leaching of nutrients

Woodland

Management concerns: Riverview—no significant limitations; Chewacla—equipment use and plant competition; Buncombe—equipment use and seedling survival

Urban Development

Dwellings

Management concerns: Riverview and Buncombe—flooding; Chewacla—flooding and wetness

Septic tank absorption fields

Management concerns: Riverview and Chewacla—flooding and wetness; Buncombe—flooding and poor filtering capacity

Local roads and streets

Management concerns: Riverview and Buncombe—flooding; Chewacla—flooding and wetness

Moderately Steep to Very Steep, Well Drained and Somewhat Excessively Drained Soils; on Mountain Uplands

The map units in this group make up about 25 percent of Polk County. They are on ridges and hill slopes at elevations above 1,200 feet. The main use is woodland. Some areas are used for dwellings, orchards, or pasture.

5. Evard-Fannin-Cowee

Strongly sloping to very steep, very deep and moderately deep soils that have a predominantly loamy subsoil; formed in residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rocks, such as biotite gneiss and migmatitic gneiss

Setting

Location in the survey area: Western part of the county at elevations above 1,200 feet
Landscape: Mountain uplands
Landform: Ridges and hill slopes
Slope range: 15 to 85 percent

Extent and Composition

Percent of the survey area: 20 percent
Evard soils—36 percent
Fannin soils—29 percent
Cowee soils—20 percent
Minor soils—15 percent (including Edneyville, Tate, Chestnut, Greenlee, and Arkaqua soils)

Soil Characteristics

Evard

Surface layer: Brown sandy loam
Subsoil: Upper part—strong brown sandy clay loam; middle part—yellowish red clay loam; lower part—yellowish red sandy clay loam that has strong brown mottles
Underlying material: Upper part—saprolite consisting of yellowish red and strong brown sandy loam; lower part—saprolite consisting of strong brown sandy loam
Depth class: Very deep
Drainage class: Well drained
Depth to high water table: More than 6 feet
Slope class: 15 to 85 percent
Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rock, such as biotite gneiss

Fannin

Surface layer: Upper part—dark brown fine sandy loam; lower part—yellowish brown fine sandy loam
Subsoil: Upper part—yellowish red clay loam; middle part—yellowish red sandy clay loam; lower part—red and yellowish red sandy clay loam that has pockets of fine sandy loam
Underlying material: Upper part—saprolite consisting of fine sandy loam in shades of red or brown that has a high content of mica; lower part—saprolite consisting of fine sandy loam in shades of brown or yellow that has a high content of mica
Depth class: Very deep
Drainage class: Well drained
Depth to high water table: More than 6 feet
Slope class: 15 to 85 percent
Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rock, such as migmatitic gneiss that has a high content of mica

Cowee

Surface layer: Upper part—dark brown gravelly sandy

loam; lower part—dark yellowish brown gravelly sandy loam
Subsoil: Upper part—yellowish red sandy clay loam; lower part—yellowish red gravelly sandy clay loam
Bedrock: Upper part—soft, weathered gneiss bedrock; lower part—hard gneiss bedrock
Depth class: Moderately deep
Depth to high water table: More than 6 feet
Drainage class: Well drained
Slope class: 15 to 85 percent
Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rocks, such as biotite gneiss and migmatitic gneiss

Minor soils

- Edneyville and Chestnut soils that have less clay in the subsoil than the major soils and that are in similar landform positions
- Tate soils that have a subsoil that is thicker than that of the major soils and that are in extremely stony coves and on hill slopes
- Greenlee soils that have more rock fragments in the subsoil than the major soils and that are in extremely stony coves and on hill slopes
- The somewhat poorly drained Arkaqua soils on nearly level flood plains

Use and Management

Major Uses: Woodland, dwellings, orchards, and pasture

Agricultural Development

Cropland

Management concerns: Erodibility, equipment use, and slope

Pasture and hayland

Management concerns: Erodibility, equipment use, and slope

Woodland

Management concerns: Evard and Fannin—equipment use and erodibility; Cowee—equipment use, hazard of windthrow, and erodibility

Urban Development

Dwellings

Management concerns: Evard—slope; Fannin—slope and a very severe hazard of erosion; Cowee—slope and depth to bedrock

Septic tank absorption fields

Management concerns: Evard and Fannin—restricted permeability and slope; Cowee—restricted permeability, slope, and depth to bedrock

Local roads and streets

Management concerns: Evard and Cowee—slope and frost action; Fannin—slope, frost action, and a very severe hazard of erosion

6. Cowee-Cliffield-Ashe-Cleveland

Strongly sloping to very steep, moderately deep and shallow soils that have a predominantly loamy subsoil; formed in residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rocks, such as biotite gneiss, porphyroblastic gneiss, migmatitic gneiss, and sillimanite-mica schist

Setting

Location in the survey area: Western part of the county at elevations above 1,200 feet
Landscape: Mountain uplands
Landform: Cowee and Cliffield—ridges; Ashe and Cleveland—hill slopes
Slope: 15 to 95 percent

Extent and Composition

Percent of the survey area: 5 percent
Cowee soils—21 percent
Cliffield soils—20 percent
Ashe soils—16 percent
Cleveland soils—11 percent
Minor soils—32 percent (including Evard, Edneyville, Tate, and Greenlee soils and areas of rock outcrop)

Soil Characteristics

Cowee

Surface layer: Upper part—dark brown gravelly sandy loam; lower part—dark yellowish brown gravelly sandy loam
Subsoil: Upper part—yellowish red sandy clay loam; lower part—yellowish red gravelly sandy clay loam
Bedrock: Upper part—soft, weathered sillimanite-mica schist bedrock; lower part—hard sillimanite-mica schist bedrock
Depth class: Moderately deep
Drainage class: Well drained
Depth to high water table: More than 6 feet
Slope range: 15 to 30 percent
Parent material: Residuum and material deposited by soil

creep that weathered mainly from high-grade metamorphic rocks, such as sillimanite-mica schist and biotite gneiss

Cliffield

Surface layer: Upper part—dark brown cobbly loam; lower part—dark yellowish brown cobbly loam
Subsoil: Upper part—yellowish brown very cobbly clay loam; lower part—strong brown very cobbly loam
Bedrock: Hard sillimanite-mica schist bedrock
Depth class: Moderately deep
Drainage class: Well drained
Depth to high water table: More than 6 feet
Slope range: 15 to 30 percent
Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rock, such as sillimanite-mica schist

Ashe

Surface layer: Very dark grayish brown sandy loam
Subsoil: Dark yellowish brown sandy loam
Underlying material: Saprolite consisting of yellowish brown sandy loam
Bedrock: Hard migmatitic gneiss bedrock
Depth class: Moderately deep
Drainage class: Somewhat excessively drained
Depth to high water table: More than 6 feet
Slope range: 50 to 95 percent
Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rocks, such as biotite gneiss, migmatitic gneiss, and porphyroblastic gneiss

Cleveland

Surface layer: Dark brown sandy loam
Subsoil: Dark yellowish brown sandy loam
Bedrock: Hard migmatitic gneiss bedrock
Depth class: Shallow
Drainage class: Somewhat excessively drained
Depth to high water table: More than 6 feet
Slope range: 50 to 95 percent
Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rocks, such as biotite gneiss, migmatitic gneiss, and porphyroblastic gneiss

Minor soils

- Evard and Edneyville soils that have bedrock at a depth of more than 60 inches and that are in landform positions similar to those of the major soils
- Areas of rock outcrop in landform positions similar to those of the major soils
- Tate soils that have a subsoil that is thicker than that of the major soils and that are in extremely stony coves and on hill slopes
- Greenlee soils that have more rock fragments in the subsoil than the major soils and that are in extremely stony coves and on hill slopes

Use and Management

Major Uses: Woodland

Agricultural Development

Cropland

Management concerns: Cliffield and Cowee—erodibility, equipment use, and droughtiness; Ashe and Cleveland—slope, depth to bedrock, and rockiness

Pasture and hayland

Management concerns: Cowee and Cliffield—erodibility, equipment use, and droughtiness; Ashe and Cleveland—slope, depth to bedrock, and rockiness

Woodland

Management concerns: Cliffield and Cleveland—erodibility, equipment use, seedling survival, and hazard of windthrow; Cowee and Ashe—erodibility, equipment use, and hazard of windthrow

Urban Development

Dwellings

Management concerns: Cliffield—depth to bedrock, large stones, and slope; Cowee—depth to bedrock and slope; Ashe and Cleveland—slope, depth to bedrock, and rockiness

Septic tank absorption fields

Management concerns: Cowee and Cliffield—depth to bedrock and slope; Ashe and Cleveland—slope, depth to bedrock, and rockiness

Local roads and streets

Management concerns: Cliffield—depth to bedrock, slope and frost action; Cowee—slope and frost action; Ashe and Cleveland—slope, depth to bedrock, and rockiness

Strongly Sloping and Moderately Steep, Well Drained Soils; on Mountain Uplands

The map unit in this group makes up about 3 percent of Polk County. It is on ridges and hill slopes at elevations above 1,200 feet. The main use is woodland. Some areas are used for orchards, pasture, or urban development.

7. Hayesville

Strongly sloping and moderately steep, very deep soils that have a predominantly clayey subsoil; formed in residuum weathered mainly from high-grade metamorphic rocks, such as biotite gneiss and migmatitic gneiss

Setting

Location in the survey area: Western part of the county at elevations above 1,200 feet
Landscape: Mountain uplands
Landform: Ridges and hill slopes
Slope: 8 to 30 percent

Extent and Composition

Percent of the survey area: 3 percent
Hayesville soils—75 percent
Minor soils—25 percent (including Fannin, Cowee, Evard, Dillard, Brevard, and Arkaqua soils)

Soil Characteristics

Hayesville

Surface layer: Yellowish brown fine sandy loam
Subsoil: Upper part—yellowish red clay loam; middle part—red clay; lower part—yellowish red clay loam
Underlying material:
Upper part—saprolite consisting of yellowish red loam that has pockets of clay loam; lower part—saprolite consisting of fine sandy loam in shades of yellow, red, or brown
Depth class: Very deep
Drainage class: Well drained
Depth to high water table: More than 6 feet
Slope range: 8 to 30 percent
Parent material: Residuum weathered mainly from high-grade metamorphic rocks, such as biotite gneiss and migmatitic gneiss

Minor soils

- Fannin, Evard, and Cowee soils that have less clay in the subsoil than the Hayesville soils and that are in similar landform positions
- The moderately well drained Dillard soils on stream terraces and hill slopes near drainageways
- The somewhat poorly drained Arkaqua soils on nearly level flood plains
- Brevard soils that have less clay in the subsoil than the Hayesville soils and that are on hill slopes

Use and Management

Major Uses: Woodland, urban development, orchards, cropland, and pasture and hayland

Agricultural Development

Cropland

Management concerns: Erodibility, equipment use, and fertility

Pasture and hayland

Management concerns: Erodibility and equipment use

Woodland

Management concerns: Equipment use and erodibility

Urban Development

Dwellings

Management concerns: Slope

Septic tank absorption fields

Management concerns: Restricted permeability and slope

Local roads and streets

Management concerns: Low strength, slope, and frost action

Strongly Sloping to Steep, Well Drained Soils; in Mountain Coves and on Foot Slopes

The map unit in this group makes up about 3 percent of Polk County. It consists of extremely stony and extremely bouldery soils. It is in coves and on hill slopes at elevations above 1,200 feet. The main use is woodland. A few areas are used for dwellings or pasture.

8. Tate-Greenlee

Strongly sloping to very steep, very deep soils that have a loamy subsoil; formed in colluvium derived from mixed geologic sources

Setting

Location in the survey area: Western part of the county at elevations above 1,200 feet
Landscape: Mountains
Landform: Coves and hill slopes
Slope: 8 to 60 percent

Extent and Composition

Percent of the survey area: 3 percent
Tate soils—47 percent
Greenlee soils—38 percent

Minor soils—15 percent (including Evard, Fannin, Ostin, Cowee, and Ashe soils)

Soil Characteristics

Tate

Surface layer: Upper part—brown cobbly sandy loam; lower part—light yellowish brown cobbly sandy loam
Subsoil: Upper part—yellowish brown sandy clay loam; middle part—strong brown sandy clay loam; lower part—strong brown gravelly sandy loam
Depth class: Very deep
Drainage class: Well drained
Depth to high water table: More than 6 feet
Slope range: 8 to 50 percent
Parent material: Colluvium derived from mixed geologic sources

Greenlee

Surface layer: Upper part—dark brown cobbly sandy loam; lower part—dark yellowish brown cobbly sandy loam
Subsoil: Upper part—dark yellowish brown very cobbly sandy loam; middle part—yellowish brown very cobbly sandy loam; lower part—strong brown very cobbly sandy loam
Depth class: Very deep
Drainage class: Well drained
Depth to high water table: More than 6 feet
Slope range: 8 to 60 percent
Parent material: Colluvium derived from mixed geologic sources

Use and Management

Major Uses: Woodland, dwellings, and pasture

Agricultural Development

Cropland

Management concerns: Slope, erodibility, and large stones

Pasture and hayland

Management concerns: Slope and large stones

Woodland

Management concerns: Tate—erodibility and equipment limitations; Greenlee—erodibility, equipment limitations, and seedling mortality

Urban Development

Dwellings

Management concerns: Tate—slope; Greenlee—slope, large stones, and instability of the soil when disturbed

Septic tank absorption fields

Management concerns: Tate—slope and restricted permeability; Greenlee—slope and large stones

Local roads and streets

Management concerns: Tate—slope and frost action; Greenlee—slope, large stones, frost action, and instability of the soil when disturbed

Detailed Soil Map Units

The map units delineated on the detailed maps at the back of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given under the heading "Use and Management of the Soils."

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. For example, the map unit Evard-Cowee complex, 30 to 50 percent slopes, stony, includes small areas having slopes of less than 30 percent or more than 50 percent. The unit also includes areas that have fewer or more stones than are required for the classification "stony." Generally, only those inclusions that are significant to use and management or that add to the user's understanding of the map unit concept are discussed.

Some included soils and miscellaneous areas have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Pacolet sandy clay loam, 8 to 15 percent slopes, eroded, is a phase of the Pacolet series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes. A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or

miscellaneous areas are somewhat similar in all areas. The number of observations in these map units are fewer than in others because of very steep slopes and inaccessibility. The detail of mapping, however, is adequate for the expected use of these soils. Pacolet-Bethlehem complex, 8 to 15 percent slopes, eroded, is an example.

This survey includes *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. Pits, quarries, is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

ApB—Appling sandy loam, 2 to 6 percent slopes

Setting

Landscape: Piedmont uplands
Landform: Broad, concave ridges
Shape of areas: Irregular
Size of areas: 5 to 25 acres

Composition

Appling soil and similar inclusions: 95 percent
Dissimilar inclusions: 5 percent

Typical Profile

Surface layer:
0 to 8 inches—brown sandy loam

Subsoil:
8 to 17 inches—yellowish brown clay
17 to 33 inches—reddish yellow clay that has red mottles
33 to 55 inches—yellowish red clay that has red mottles
55 to 65 inches—yellowish red and strong brown clay loam that has red mottles

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Gently sloping
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Strongly acid or very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
- The moderately well drained Dogue soils in low areas near drainageways

Similar inclusions:
- Appling soils that have a surface layer of moderately eroded sandy clay loam or clay loam
- Soils that are similar to the Appling soil but have a redder subsoil

Use and Management

Major Uses: Pasture and hayland, orchards, cropland, and woodland

Agricultural Development

Cropland

Suitability: Well suited
Potential productivity: High
Management concerns: Erodibility and fertility
Management measures and considerations:
- Terraces and diversions, stripcropping, contour farming, no-till farming, and crop residue management reduce the hazard of erosion, control runoff, and increase the infiltration of rainfall.
- Applying lime and fertilizer according to recommendations based on soil tests increases the availability of plant nutrients and helps to maximize productivity.

Pasture and hayland

Suitability: Well suited
Potential productivity: High
Management concerns:
- There are no significant limitations affecting the management of pasture and hayland.

Management measures and considerations:
- A rotational grazing system and a well-planned clipping and harvesting schedule help to keep the pasture in good condition and increase productivity.

Woodland

Suitability: Well suited
Management concerns:
- There are no significant limitations affecting woodland management.

Management measures and considerations:
- Planting the appropriate species, as recommended by a forester, helps to maximize productivity and ensure planting success.

Urban Development

Dwellings

Suitability: Well suited
Management concerns:
• There are no significant limitations affecting dwellings.
Management measures and considerations:
• Vegetating cleared and graded areas as soon as possible or constructing silt fences helps to maintain soil stability and keep sediments onsite.

Septic tank absorption fields

Suitability: Moderately suited
Management concerns: Restricted permeability
Management measures and considerations:
• Increasing the size of the absorption field helps to improve the performance of the septic tank.
• Installing the distribution lines of septic systems during dry periods helps to prevent smearing and sealing of trench walls.

Local roads and streets

Suitability: Moderately suited
Management concerns: Low strength
Management measures and considerations:
• Providing sand and gravel and compacting roadbeds improve soil strength.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 8A, based on loblolly pine as the indicator species

ArA—Arkaqua loam, 0 to 2 percent slopes, occasionally flooded

Setting

Landscape: Mountain valleys
Landform: Flood plains
Shape of areas: Long and narrow
Size of areas: 4 to 40 acres

Composition

Arkaqua soil and similar inclusions: 85 percent
Dissimilar inclusions: 15 percent

Typical Profile

Surface layer:
0 to 10 inches—dark yellowish brown loam

Subsoil:
10 to 20 inches—dark yellowish brown loam that has reddish brown iron concentrations
20 to 31 inches—yellowish brown sandy clay loam that has reddish brown iron concentrations and light brownish gray iron depletions
31 to 38 inches—gray sandy clay loam that has brownish yellow iron concentrations

Underlying material:
38 to 48 inches—gray sandy loam that has lenses of sandy clay loam
48 to 51 inches—very dark grayish brown loam that has lenses of sandy loam
51 to 60 inches—pale brown and yellowish brown gravelly loamy sand

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Available water capacity: High
Depth to high water table: 1.5 to 2.0 feet
Flooding: Occasional for very brief periods
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Nearly level
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Moderately acid to very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• The moderately well drained Dillard soils in the slightly higher areas
• Soils that are poorly drained and are in depressions
• Soils that have a sandy subsoil and are adjacent to the stream channel
• Soils that have more rock fragments in the subsoil than the Arkaqua soil and are in similar landform positions
Similar inclusions:
• Soils that are similar to the Arkaqua soil but have less clay in the subsoil

Use and Management

Major Uses: Cropland, pasture and hayland, and woodland

Agricultural Development

Cropland

Suitability: Moderately suited
Potential productivity: High
Management concerns: Flooding and wetness

Management measures and considerations:
• Harvesting row crops as early as possible helps to reduce the risk of damage caused by flooding.
• Installing an artificial drainage system helps to reduce the wetness limitation and improves productivity.
• Planting wetness-tolerant species in undrained areas helps to improve productivity.

Pasture and hayland

Suitability for pasture: Well suited
Suitability for hayland: Moderately suited
Potential productivity: Very high
Management concerns: Flooding and wetness
Management measures and considerations:
• Harvesting hay crops as early as possible helps to reduce the risk of damage caused by flooding.
• Escape routes to higher areas should be provided to livestock during periods of flooding.
• Preventing overgrazing or preventing grazing when the soil is too wet helps to prevent compaction, decreased productivity, and a rough soil surface.
• Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.

Woodland

Suitability: Well suited
Management concerns: Equipment use and plant competition
Management measures and considerations:
• Restricting the use of standard wheeled and tracked equipment to dry periods helps to prevent the rutting and compaction that can occur when the soil is saturated.
• Site preparation practices, such as chopping, prescribed burning, and applications of herbicide, help to reduce competition from unwanted plants.
• Establishing a buffer zone of trees and shrubs in areas adjacent to streams helps to reduce siltation and provides shade for the water surface.

Urban Development

Dwellings

Suitability: Unsuited
Management concerns:
• The flooding and wetness are severe limitations affecting dwellings. A site should be selected on better suited soils.

Septic tank absorption fields

Suitability: Unsuited
Management concerns:
• The flooding and wetness are severe limitations affecting septic tank absorption fields. A site should be selected on better suited soils.

Local roads and streets

Suitability: Unsuited
Management concerns:
• The flooding and wetness are severe limitations affecting roads and streets. A site should be selected on better suited soils.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 8W, based on yellow-poplar as the indicator species

AsF—Ashe-Cleveland-Rock outcrop complex, 50 to 95 percent slopes

Setting

Landscape: Mountain uplands
Landform: Rocky hill slopes
Component location: Ashe—areas away from rock outcrops; Cleveland—areas adjacent to rock outcrops; Rock outcrop—randomly scattered areas
Shape of areas: Irregular or long and narrow
Size of areas: 10 to 900 acres

Composition

Ashe soil and similar inclusions: 40 percent
Cleveland soil and similar inclusions: 25 percent
Rock outcrop: 20 percent
Dissimilar inclusions: 15 percent

Typical Profile

Ashe

Surface layer:
0 to 4 inches—very dark grayish brown sandy loam

Subsoil:
4 to 14 inches—dark yellowish brown sandy loam

Underlying material:
14 to 32 inches—saprolite consisting of yellowish brown sandy loam

Bedrock:
32 inches—hard migmatitic gneiss bedrock

Cleveland

Surface layer:
0 to 4 inches—dark brown sandy loam

Subsoil:
4 to 13 inches—dark yellowish brown sandy loam

Bedrock:
13 inches—hard migmatitic gneiss bedrock

Soil Properties and Qualities

Depth class: Ashe—moderately deep; Cleveland—shallow
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: Low
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Very steep
Rock fragments: 0.1 to 15 percent surface coverage
Reaction: Moderately acid to very strongly acid
Depth to bedrock: Ashe—20 to 40 inches to hard bedrock; Cleveland—10 to 20 inches to hard bedrock

Inclusions

Dissimilar inclusions:
• Soils that have hard bedrock at a depth of more than 60 inches and occur in areas away from rock outcrops
• Extremely bouldery soils that occur below rock outcrops
Similar inclusions:
• Soils that are similar to the Ashe and Cleveland soils but have more clay in the subsoil

Use and Management

Major Uses: Woodland

Agricultural Development

Cropland

Suitability: Unsuited
Management concerns:
• The slope, depth to bedrock, and rockiness are severe limitations affecting crop production. A site should be selected on better suited soils.

Pasture and hayland

Suitability: Unsuited
Management concerns:
• The slope, depth to bedrock, and rockiness are severe limitations affecting the production of pasture and hay crops. A site should be selected on better suited soils.

Woodland

Suitability: Ashe—moderately suited; Cleveland—poorly suited
Management concerns: Ashe—erodibility, equipment use, and hazard of windthrow; Cleveland—erodibility, equipment use, seedling survival, and hazard of windthrow
Management measures and considerations:
• Using cable logging methods helps to overcome limitations, including the slope, stoniness, and the large amount of rock outcrops, that affect the construction of roads and trails.
• Where possible, roads and skid trails should be constructed on the contour in areas around rock outcrops.
• Suitable access should be maintained for equipment used in the periodic salvage of windthrown trees.

Urban Development

Dwellings

Suitability: Unsuited
Management concerns:
• The slope, depth to bedrock, and rockiness are severe limitations affecting dwellings. A site should be selected on better suited soils.

Septic tank absorption fields

Suitability: Unsuited
Management concerns:
• The slope, depth to bedrock, and rockiness are severe limitations affecting septic tank absorption fields.
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Unsuited
Management concerns:
• The slope, depth to bedrock, and rockiness are severe limitations affecting roads and streets. A site should be selected on better suited soils.

Interpretive Groups

Land capability classification: Ashe—VIIs; Cleveland—VIIe; Rock outcrop—VIIIs
Woodland ordination symbol: Based on chestnut oak as the indicator species, 3R in areas of the Ashe soil and 2R in areas of the Cleveland soil; Rock outcrop—none assigned

BrC—Brevard sandy loam, 8 to 15 percent slopes

Setting

Landscape: Mountain uplands
Landform: Coves and hill slopes
Shape of areas: Irregular
Size of areas: 5 to 45 acres

Composition

Brevard soil and similar inclusions: 90 percent
Dissimilar inclusions: 10 percent

Typical Profile

Surface layer:
0 to 6 inches—dark brown sandy loam

Subsoil:
6 to 20 inches—yellowish red sandy clay loam
20 to 29 inches—yellowish red clay loam
29 to 38 inches—yellowish red clay loam that has red mottles
38 to 65 inches—red clay loam that has strong brown mottles

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Strongly sloping
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Moderately acid to very strongly acid in unlimed areas; ranging to slightly acid in the upper part in limed areas
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• The moderately well drained Dillard soils in the lower concave areas
• The somewhat poorly drained, occasionally flooded Arkaqua soils in the lower areas adjacent to streams
Similar inclusions:
• Brevard soils that have a surface layer of moderately eroded sandy clay loam or clay loam
• Soils that are similar to the Brevard soil but have a browner subsoil
• Soils that are similar to the Brevard soil but have more clay in the subsoil

Use and Management

Major Uses: Woodland, cropland, and pasture and hayland

Agricultural Development

Cropland

Suitability: Moderately suited
Potential productivity: Moderately high
Management concerns: Erodibility and fertility
Management measures and considerations:
• Resource management systems that include conservation tillage, crop residue management, stripcropping, and sod-based rotations help to reduce the hazard of erosion, control runoff, and maximize water infiltration.
• Applying lime and fertilizer according to recommendations based on soil tests increases the availability of plant nutrients and helps to maximize productivity.

Pasture and hayland

Suitability for pasture: Well suited
Suitability for hayland: Moderately suited
Potential productivity: Moderately high
Management concerns: Erodibility and equipment use
Management measures and considerations:
• Planting adapted species helps to ensure the production of high-quality forage and reduce the hazard of erosion.
• Preparing seedbeds on the contour or across the slope helps to reduce the hazard of erosion and increase germination.
• The slope may limit equipment use in the steeper areas during the harvest of hay crops.
• Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.

Woodland

Suitability: Well suited
Management concerns:
• There are no significant limitations affecting woodland management.
Management measures and considerations:
• Planting the appropriate species, as recommended by a forester, helps to maximize productivity and ensure planting success.

Urban Development

Dwellings

Suitability: Moderately suited
Management concerns: Slope
Management measures and considerations:
• Designing structures so that they conform to the natural slope helps to improve soil performance.
• Grading or land shaping can divert upslope surface water away from foundations.
• Vegetating cleared and graded areas as soon as possible or constructing silt fences helps to maintain soil stability and keep sediments onsite.

Septic tank absorption fields

Suitability: Moderately suited
Management concerns: Restricted permeability and slope
Management measures and considerations:
• Increasing the size of the absorption field helps to improve the performance of the septic tank.
• Installing the distribution lines of septic systems during dry periods helps to prevent smearing and sealing of trench walls.
• Installing distribution lines on the contour helps to improve the performance of septic tank absorption fields.

Local roads and streets

Suitability: Moderately suited
Management concerns: Low strength, slope, and frost action
Management measures and considerations:
• Providing sand and gravel and compacting roadbeds improve soil strength.
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Using suitable subgrade or base material helps to reduce damage from frost heaving.
• Vegetating cut and fill slopes as soon as possible after construction helps to stabilize the soil and prevents excessive erosion.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 11A, based on eastern white pine as the indicator species

BuB—Buncombe loamy sand, 0 to 5 percent slopes, occasionally flooded

Setting

Landscape: Piedmont valleys
Landform: Flood plains
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 150 acres

Composition

Buncombe soil and similar inclusions: 90 percent
Dissimilar inclusions: 10 percent

Typical Profile

Surface layer:
0 to 15 inches—dark yellowish brown loamy sand

Underlying material:
15 to 38 inches—yellowish brown sand
38 to 42 inches—light yellowish brown sand
42 to 48 inches—brown sand
48 to 65 inches—pale brown sand

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid
Available water capacity: Low
Depth to high water table: Greater than 6 feet
Flooding: Occasional for very brief periods
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Nearly level or gently sloping
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Slightly acid to very strongly acid
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• The well drained, loamy Riverview soils in wide areas away from the stream channel
• The somewhat poorly drained, loamy Chewacla soils in depressions adjacent to the uplands
Similar inclusions:
• Buncombe soils that are rarely flooded
• Buncombe soils that have a loamy surface layer
• Sandy soils that have loamy subsoil layers within a depth of 40 inches

Use and Management

Major Uses: Woodland, cropland, and pasture

Agricultural Development

Cropland

Suitability: Moderately suited
Potential productivity: Low
Management concerns: Flooding, droughtiness, and leaching of nutrients
Management measures and considerations:
• Harvesting row crops as early as possible helps to reduce the risk of damage caused by flooding.
• Incorporating crop residue or organic matter into the soil helps to improve the available water capacity.
• Providing supplemental irrigation (fig. 6) and planting crop varieties adapted to droughty conditions help to increase crop production.
• Irrigation water should be used in frequent and light applications to prevent the leaching of plant nutrients and pesticides below the plant roots.

Pasture and hayland

Suitability: Moderately suited

Figure 6.—A nursery operation on Buncombe loamy sand, 0 to 5 percent slopes, occasionally flooded. A supplemental irrigation system helps to overcome the droughtiness.

Potential productivity: Low
Management concerns: Flooding, droughtiness, and leaching of nutrients
Management measures and considerations:
• Harvesting hay crops as early as possible helps to reduce the risk of damage caused by flooding.
• Escape routes to higher areas should be provided to livestock during periods of flooding.
• Providing supplemental irrigation water and planting crop varieties adapted to droughty conditions help to increase crop production.
• Using fertilizer and herbicides in split applications helps to increase their effectiveness.
• Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.

Woodland

Suitability: Well suited
Management concerns: Equipment use and seedling survival
Management measures and considerations:
• Using tracked or low-pressure ground equipment during harvesting helps to prevent rutting and root compaction.
• Replanting may be needed because of seedling mortality.

• Planting seedlings during wet, cool periods helps to improve survival rates.

Urban Development

Dwellings

Suitability: Unsuited
Management concerns:
• The flooding is a severe limitation affecting dwellings. A site should be selected on better suited soils.

Septic tank absorption fields

Suitability: Unsuited
Management concerns:
• The flooding and poor filtering capacity are severe limitations affecting septic tank absorption fields. A site should be selected on better suited soils.

Local roads and streets

Suitability: Unsuited
Management concerns:
• The flooding is a severe limitation affecting roads and streets. A site should be selected on better suited soils.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 8S, based on yellow-poplar as the indicator species

CeB2—Cecil sandy clay loam, 2 to 8 percent slopes, eroded

Setting

Landscape: Piedmont uplands
Landform: Broad ridges
Shape of areas: Irregular
Size of areas: 5 to 3,000 acres

Composition

Cecil soil and similar inclusions: 90 percent
Dissimilar inclusions: 10 percent

Typical Profile

Surface layer:
0 to 6 inches—strong brown sandy clay loam

Subsoil:
6 to 25 inches—red clay
25 to 42 inches—red clay
42 to 58 inches—red clay that has yellowish red mottles
58 to 65 inches—yellowish red clay loam that has strong brown mottles

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Moderate
Slope class: Gently sloping
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Strongly acid or very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• Bethlehem soils that have soft, weathered bedrock at a depth of less than 40 inches and are in convex, gravelly areas
Similar inclusions:
• Cecil soils that have a surface layer of slightly eroded sandy loam
• Soils that are similar to the Cecil soil but have a thinner subsoil
• Soils that are similar to the Cecil soil but have a browner subsoil

Use and Management

Major Uses: Cropland, pasture and hayland, woodland, orchards, and urban development

Agricultural Development

Cropland

Suitability: Well suited
Potential productivity: Moderately high
Management concerns: Erodibility, tilth, and fertility
Management measures and considerations:
• Resource management systems that include conservation tillage, crop residue management, stripcropping, and sod-based rotations help to reduce the hazard of erosion, control surface runoff, and maximize water infiltration.
• Incorporating crop residue into the soil or leaving residue on the soil surface helps to minimize clodding and crusting and maximize water infiltration.
• Tilling only during dry periods helps to prevent clodding and crusting and increase water infiltration.
• Applying lime and fertilizer according to recommendations based on soil tests increases the

availability of plant nutrients and helps to maximize productivity.

Pasture and hayland

Suitability: Well suited
Potential productivity: Moderately high
Management concerns: Erodibility
Management measures and considerations:
• Planting adapted species helps to ensure the production of high-quality forage and reduce the hazard of erosion.
• A rotational grazing system and a well-planned clipping and harvesting schedule help to keep the pasture in good condition and increase productivity.

Woodland

Suitability: Well suited
Management concerns: Equipment use and seedling survival
Management measures and considerations:
• Unsurfaced roads may be impassible during wet periods because of the high content of clay.
• Logging only during dry periods helps to prevent rutting and damage to tree roots as a result of compaction.
• Replanting may be needed because of seedling mortality.
• Planting seedlings during wet, cool periods helps to improve survival rates.

Urban Development

Dwellings

Suitability: Well suited
Management concerns:
• There are no significant limitations affecting dwellings.
Management measures and considerations:
• Vegetating cleared and graded areas as soon as possible or constructing silt fences helps to maintain soil stability and keep sediments onsite.

Septic tank absorption fields

Suitability: Moderately suited
Management concerns: Restricted permeability
Management measures and considerations:
• Increasing the size of the absorption field helps to improve the performance of the septic tank.
• Installing the distribution lines of septic systems during dry periods helps to prevent smearing and sealing of trench walls.

Local roads and streets

Suitability: Moderately suited
Management concerns: Low strength
Management measures and considerations:
• Providing sand and gravel and compacting roadbeds improve soil strength.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 7C, based on loblolly pine as the indicator species

ChA—Chewacla loam, 0 to 2 percent slopes, occasionally flooded

Setting

Landscape: Piedmont valleys
Landform: Flood plains
Shape of areas: Long and narrow
Size of areas: 4 to 100 acres

Composition

Chewacla soil and similar inclusions: 85 percent
Dissimilar inclusions: 15 percent

Typical Profile

Surface layer:
0 to 7 inches—dark brown loam

Subsoil:
7 to 16 inches—brown loam that has light brown iron concentrations
16 to 21 inches—dark brown loam that has dark gray iron depletions

Underlying material:
21 to 48 inches—gray silty clay loam that has yellowish brown iron concentrations
48 to 65 inches—gray silty clay loam that has dark reddish brown iron concentrations

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Available water capacity: High
Depth to high water table: 0.5 foot to 1.5 feet
Flooding: Occasional for brief periods
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Nearly level
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Slightly acid to very strongly acid within a depth of 40 inches; slightly alkaline to very strongly acid below a depth of 40 inches
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
- The well drained Riverview soils in landform positions that are similar to those of the Chewacla soil
- The excessively drained, sandy Buncombe soils in areas near the stream channel
- The clayey Dogue and Roanoke soils in the higher, rarely flooded areas
- The poorly drained Wehadkee soils in frequently flooded depressions
- Small shallow pits and gravel piles in areas which were mined for gold

Similar inclusions:
- Soils that are similar to the Chewacla soil but have less clay in the subsoil

Use and Management

Major Uses: Woodland, cropland, and pasture and hayland

Agricultural Development

Cropland

Suitability: Moderately suited
Potential productivity: High
Management concerns: Flooding and wetness
Management measures and considerations:
- Harvesting row crops as early as possible helps to reduce the risk of damage caused by flooding.
- Installing an artificial drainage system helps to reduce the wetness limitation and improves productivity.
- Planting wetness-tolerant species in undrained areas helps to improve productivity.

Pasture and hayland

Suitability for pasture: Well suited
Suitability for hayland: Moderately suited
Potential productivity: Very high
Management concerns: Flooding and wetness
Management measures and considerations:
- Harvesting hay crops as early as possible helps to reduce the risk of damage caused by flooding.
- Escape routes to higher areas should be provided to livestock during periods of flooding.
- Preventing overgrazing or preventing grazing when the soil is too wet helps to prevent compaction, decreased productivity, and a rough soil surface.
- Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.

Woodland

Suitability: Well suited
Management concerns: Equipment use and plant competition
Management measures and considerations:
- Restricting the use of standard wheeled and tracked equipment to dry periods helps to prevent the rutting and compaction that can occur when the soil is saturated.
- Site preparation practices, such as chopping, prescribed burning, and applications of herbicide, help to reduce competition from unwanted plants.
- Establishing a buffer zone of trees and shrubs in areas adjacent to streams helps to reduce siltation and provides shade for the water surface.

Urban Development

Dwellings

Suitability: Unsuited
Management concerns:
- The flooding and wetness are severe limitations affecting dwellings. A site should be selected on better suited soils.

Septic tank absorption fields

Suitability: Unsuited
Management concerns:
- The flooding and wetness are severe limitations affecting septic tank absorption fields. A site should be selected on better suited soils.

Local roads and streets

Suitability: Unsuited
Management concerns:
- The flooding and wetness are severe limitations affecting roads and streets. A site should be selected on better suited soils.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 7W, based on yellow-poplar as the indicator species

CxD—Cliffield-Cowee complex, 15 to 30 percent slopes, very stony

Setting

Landscape: Mountain uplands
Landform: Very stony ridges
Component location: Cliffield—convex, more stony areas; Cowee—concave, less stony areas
Shape of areas: Irregular
Size of areas: 10 to 600 acres

Composition

Cliffield soil and similar inclusions: 45 percent
Cowee soil and similar inclusions: 40 percent
Dissimilar inclusions: 15 percent

Typical Profile

Cliffield

Surface layer:
0 to 2 inches—dark brown cobbly loam
2 to 4 inches—dark yellowish brown cobbly loam

Subsoil:
4 to 16 inches—yellowish brown very cobbly clay loam
16 to 33 inches—strong brown very cobbly loam

Bedrock:
33 inches—hard sillimanite-mica schist bedrock

Cowee

Surface layer:
0 to 4 inches—dark brown gravelly sandy loam
4 to 6 inches—dark yellowish brown gravelly sandy loam

Subsoil:
6 to 19 inches—yellowish red sandy clay loam
19 to 25 inches—yellowish red gravelly sandy clay loam

Bedrock:
25 to 46 inches—soft, weathered sillimanite-mica schist bedrock
46 inches—hard sillimanite-mica schist bedrock

Soil Properties and Qualities

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Low
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Moderately steep
Rock fragments: 0.1 to 3.0 percent surface coverage
Reaction: Strongly acid to extremely acid
Depth to bedrock: Cliffield—20 to 40 inches to hard bedrock; Cowee—20 to 40 inches to soft, weathered bedrock and typically 40 to 60 inches to hard bedrock

Inclusions

Dissimilar inclusions:
• Evard soils that have bedrock at a depth of more than 60 inches and are in the concave, less stony areas
• Soils that have bedrock within a depth of 20 inches and are in randomly scattered areas

Similar inclusions:
• Soils that are similar to the Cowee soil but have a clayey subsoil
• Soils that are similar to the Cowee soil but have a browner subsoil

Use and Management

Major Uses: Woodland

Agricultural Development

Cropland

Suitability: Cliffield—unsuited; Cowee—poorly suited
Potential productivity: Cowee—low
Management concerns: Erodibility, equipment use, and droughtiness
Management measures and considerations:
• All surface stones large enough to interfere with cropland management should be removed.
• Special equipment or planning may be needed to safely plant and harvest crops on these soils.

Pasture and hayland

Suitability for pasture: Cliffield—poorly suited; Cowee—moderately suited
Suitability for hayland: Cliffield—unsuited; Cowee—poorly suited
Potential productivity: Cliffield—low; Cowee—moderate
Management concerns: Erodibility, equipment use, and droughtiness
Management measures and considerations:
• The slope limits equipment use in the steeper areas of this map unit.
• All surface stones large enough to interfere with the management of forage and livestock should be removed.
• Persistent, drought-resistant forage species should be planted.

Woodland

Suitability: Moderately suited
Management concerns: Cliffield—erodibility, equipment use, seedling survival, and hazard of windthrow; Cowee—erodibility, equipment use, and hazard of windthrow
Management measures and considerations:
• Installing broad-based dips, water bars, and culverts helps to stabilize logging roads, skid trails, and landings.
• Reseeding all disturbed areas with adapted grasses and legumes helps to prevent erosion.
• Constructing roads, fire lanes, and skid trails on the contour helps to overcome the slope.
• Suitable access should be maintained for equipment used in the periodic salvage of windthrown trees.

• Managing the natural regeneration of hardwoods is the best method of reforestation.

Urban Development

Dwellings

Suitability: Poorly suited
Management concerns: Cliffield—depth to bedrock, large stones, and slope; Cowee—depth to bedrock and slope
Management measures and considerations:
• Special earthmoving equipment or the drilling and blasting of rock may be needed.

Septic tank absorption fields

Suitability: Poorly suited
Management concerns: Depth to bedrock and slope
Management measures and considerations:
• Onsite waste disposal systems may be needed, or it may be necessary to select sites on the deeper included soils.
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Poorly suited
Management concerns: Cliffield—depth to bedrock, slope, and frost action; Cowee—slope and frost action
Management measures and considerations:
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Using suitable subgrade or base material helps to minimize the damage to roads and streets caused by frost heaving.
• Blasting or special grading equipment may be needed in constructing roads on the these soils.

Interpretive Groups

Land capability classification: Cliffield—VIs; Cowee—VIe
Woodland ordination symbol: Based on chestnut oak as the indicator species, 2R in areas of the Cliffield soil and 3R in areas of the Cowee soil

DdB—Dillard sandy loam, 1 to 6 percent slopes, rarely flooded

Setting

Landscape: Mountain valleys and the lower uplands
Landform: Stream terraces and hill slopes near drainageways
Shape of areas: Irregular or long and narrow
Size of areas: 6 to 15 acres

Composition

Dillard soil and similar inclusions: 85 percent
Dissimilar inclusions: 15 percent

Typical Profile

Surface layer:
0 to 11 inches—dark brown sandy loam

Subsoil:
11 to 20 inches—yellowish brown sandy clay loam
20 to 32 inches—yellowish brown clay loam that has light brownish gray iron depletions and yellowish brown iron concentrations
32 to 48 inches—light brownish gray sandy clay loam that has iron concentrations in shades of brown or yellow

Underlying material:
48 to 65 inches—light brownish gray sandy loam that has dark brown iron concentrations

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderately slow
Available water capacity: High
Depth to high water table: 2.0 to 3.0 feet
Flooding: Rare
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Nearly level or gently sloping
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Strongly acid or very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• The well drained Brevard soils in the higher areas
• The somewhat poorly drained, occasionally flooded Arkaqua soils in the lower areas adjacent to streams
• Soils that are poorly drained in depressions
Similar inclusions:
• Dillard soils that have a surface layer of moderately eroded sandy clay loam or clay loam
• Soils that are similar to the Dillard soil and have saprolite within a depth of 40 inches
• Soils that are similar to the Dillard soil but have more clay in the subsoil

Use and Management

Major Uses: Woodland, cropland, and pasture

Agricultural Development

Cropland

Suitability: Well suited
Potential productivity: High
Management concerns: Erodibility, wetness, and limited size of areas
Management measures and considerations:
• Terraces and diversions, stripcropping, contour farming, no-till farming, and crop residue management reduce the hazard of erosion, control runoff, and increase the infiltration of rainfall.
• Installing an artificial drainage system helps to reduce the wetness limitation and improves productivity.
• Managing areas of this map unit for crop production is difficult because of the small size of the areas.

Pasture and hayland

Suitability: Well suited
Potential productivity: Very high
Management concerns: Wetness and limited size of areas
Management measures and considerations:
• Preventing overgrazing or preventing grazing when the soil is too wet helps to prevent compaction, decreased productivity, and a rough soil surface.
• Managing areas of this map unit for the production of pasture and hay crops is difficult because of the small size of the areas.

Woodland

Suitability: Well suited
Management concerns:
• There are no significant limitations affecting woodland management.
Management measures and considerations:
• Planting the appropriate species, as recommended by a forester, helps to maximize productivity and ensure planting success.

Urban Development

Dwellings

Suitability: Poorly suited
Management concerns: Wetness and flooding
Management measures and considerations:
• Building structures on the highest part of the landscape and installing an artificial drainage system help to prevent damage caused by the wetness and flooding.
• Installing a subsurface drainage system helps to lower the high water table.

Septic tank absorption fields

Suitability: Poorly suited
Management concerns: Restricted permeability and wetness
Management measures and considerations:
• Additions of suitable fill material can raise the filter field a sufficient distance above the high water table and thus help to improve the performance of the septic system.
• Onsite waste disposal systems may require special design.
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Moderately suited
Management concerns: Low strength and wetness
Management measures and considerations:
• Providing sand and gravel and compacting roadbeds improve soil strength.
• Constructing roads on raised areas of well-compacted fill material helps to overcome the wetness limitation.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 12A, based on eastern white pine as the indicator species

DoB—Dogue-Roanoke complex, 0 to 6 percent slopes, rarely flooded

Setting

Landscape: Piedmont valleys
Landform: Stream terraces
Component location: Dogue—convex, gently sloping areas; Roanoke—concave, nearly level areas
Shape of areas: Irregular or long and narrow
Size of areas: 5 to 45 acres

Composition

Dogue soil and similar inclusions: 75 percent
Roanoke soil and similar inclusions: 10 percent
Dissimilar inclusions: 15 percent

Typical Profile

Dogue

Surface layer:
0 to 6 inches—dark grayish brown sandy loam

Subsoil:
6 to 17 inches—dark yellowish brown clay
17 to 23 inches—yellowish brown clay that has yellowish red iron concentrations and pale brown iron depletions
23 to 31 inches—yellowish brown clay that has light

brownish gray iron depletions and dark reddish brown iron concentrations
31 to 41 inches—light gray clay that has strong brown and brownish yellow iron concentrations
41 to 58 inches—gray sandy clay that has light yellowish brown iron concentrations

Underlying material:
58 to 62 inches—gray sandy clay loam

Roanoke

Surface layer:
0 to 5 inches—very dark gray loam

Subsoil:
5 to 9 inches—dark gray clay loam
9 to 21 inches—gray clay that has strong brown iron concentrations
21 to 41 inches—gray clay

Underlying material:
41 to 50 inches—very dark gray loam
50 to 65 inches—gray silty clay loam

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Dogue—moderately well drained; Roanoke—poorly drained
Permeability: Dogue—moderately slow; Roanoke—slow
Available water capacity: High
High water table: Dogue—at a depth of 1.5 to 3.0 feet; Roanoke—within a depth of 1.0 foot
Flooding: Rare
Shrink-swell potential: Moderate
Extent of erosion: Slight
Slope class: Dogue—nearly level or gently sloping; Roanoke—nearly level
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Strongly acid to extremely acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• The occasionally flooded, loamy Chewacla soils in areas near the stream channel
• The frequently flooded, loamy Wehadkee soils in depressions near the stream channel
• The well drained Masada and Skyuka soils in the higher areas
Similar inclusions:
• Soils that are similar to the Dogue and Roanoke soils but have less clay in the subsoil
• Soils that are similar to the Dogue and Roanoke soils and that overlie older deposits of alluvium and organic materials
• Soils that are similar to the Dogue and Roanoke soils and have saprolite within a depth of 40 inches

Use and Management

Major Uses: Woodland, cropland, and pasture and hayland

Agricultural Development

Cropland

Suitability: Dogue—well suited; Roanoke—moderately suited
Potential productivity: Dogue—high; Roanoke—moderate
Management concerns: Dogue—erodibility, wetness, and limited size of areas; Roanoke—excessive wetness and limited size of areas
Management measures and considerations:
• Terraces and diversions, stripcropping, contour farming, no-till farming, and crop residue management reduce the hazard of erosion, control runoff, and increase the infiltration of rainfall.
• Installing an artificial drainage system in areas of the Dogue soil helps to reduce the wetness limitation and improves productivity.
• Federal and State regulations protecting wetlands may restrict the use of drainage systems and other alterations in areas of this map unit.
• Managing areas of this map unit for crop production is difficult because of the small size of the areas.

Pasture and hayland

Suitability: Dogue—well suited; Roanoke—moderately suited
Potential productivity: Dogue—high; Roanoke—moderately high
Management concerns: Dogue—wetness and limited size of areas; Roanoke—excessive wetness and limited size of areas
Management measures and considerations:
• Planting wetness-tolerant species in undrained areas helps to improve productivity.
• Preventing overgrazing or preventing grazing when the soils are too wet helps to prevent compaction, decreased productivity, and a rough soil surface.
• Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.
• Managing areas of this map unit for the production of pasture and hay crops is difficult because of the small size of the areas.
• Federal and State regulations protecting wetlands may

restrict the use of drainage systems and other alterations in areas of this map unit.

Woodland

Suitability: Dogue—well suited; Roanoke—moderately suited
Management concerns: Dogue—equipment use; Roanoke—equipment use, seedling survival, and competition from undesirable plants
Management measures and considerations:
• Restricting the use of standard wheeled and tracked equipment to dry periods helps to prevent the rutting and compaction that can occur when the soils are saturated.
• Planting trees that are tolerant of wetness helps to increase seedling survival rates.
• Site preparation practices, such as chopping, prescribed burning, and applications of herbicide, help to reduce competition from unwanted plants.
• Federal and State regulations protecting wetlands may restrict the use of drainage systems and other alterations in areas of this map unit.

Urban Development

Dwellings

Suitability: Poorly suited
Management concerns: Dogue—wetness, flooding, and shrink-swell potential; Roanoke—excessive wetness and flooding
Management measures and considerations:
• Building structures on the highest part of the landscape and installing an artificial drainage system help to prevent damage caused by the wetness and flooding.
• Reinforcing foundations or backfilling with coarse textured material helps to strengthen buildings and prevents damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management concerns: Restricted permeability and wetness
Management measures and considerations:
• Additions of suitable fill material can raise the filter field a sufficient distance above the high water table and thus help to improve the performance of the septic system.
• Onsite waste disposal systems may require special design.
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Poorly suited
Management concerns: Dogue—low strength; Roanoke—low strength and wetness
Management measures and considerations:
• Providing sand and gravel and compacting roadbeds improve soil strength.
• Constructing roads on raised areas of well-compacted fill material helps to overcome the wetness limitation.

Interpretive Groups

Land capability classification: Dogue—IIe; Roanoke—IVw
Woodland ordination symbol: Based on yellow-poplar as the indicator species, 7A in areas of the Dogue soil and 7W in areas of the Roanoke soil

EdF—Edneyville-Chestnut complex, 50 to 95 percent slopes, stony

Setting

Landscape: Mountain uplands
Landform: Stony hill slopes
Component location: Edneyville—concave, less sloping areas; Chestnut—convex, more sloping areas
Shape of areas: Irregular
Size of areas: 50 to 950 acres

Composition

Edneyville soil and similar inclusions: 55 percent
Chestnut soil and similar inclusions: 30 percent
Dissimilar inclusions: 15 percent

Typical Profile

Edneyville

Surface layer:
0 to 3 inches—dark brown sandy loam

Subsoil:
3 to 14 inches—yellowish brown sandy loam
14 to 31 inches—yellowish brown sandy loam

Underlying material:
31 to 65 inches—saprolite consisting of loamy sand in shades of brown, yellow, or white

Chestnut

Surface layer:
0 to 3 inches—dark brown sandy loam

Subsoil:
3 to 20 inches—yellowish brown sandy loam

Underlying material:
20 to 25 inches—saprolite consisting of light yellowish brown sandy loam

Bedrock:
25 to 48 inches—soft, weathered porphyroblastic gneiss bedrock
48 inches—hard porphyroblastic gneiss bedrock

Soil Properties and Qualities

Depth class: Edneyville—very deep; Chestnut—moderately deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Edneyville—moderate; Chestnut—low
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Very steep
Rock fragments: 0.01 to 0.1 percent surface coverage
Reaction: Moderately acid to very strongly acid
Depth to bedrock: Edneyville—greater than 60 inches; Chestnut—20 to 40 inches to soft, weathered bedrock and typically 40 to 60 inches to hard bedrock

Inclusions

Dissimilar inclusions:
- Randomly scattered small areas of rock outcrops
- Cleveland soils that have hard bedrock at a depth of less than 20 inches and occur near small areas of rock outcrops
- Greenlee soils in extremely bouldery areas

Similar inclusions:
- Soils that are similar to the Edneyville and Chestnut soils but have more clay in the subsoil

Use and Management

Major Uses: Woodland

Agricultural Development

Cropland

Suitability: Unsuited
Management concerns:
- The slope is a severe limitation affecting crop production. A site should be selected on better suited soils.

Pasture and hayland

Suitability: Unsuited
Management concerns:
- The slope is a severe limitation affecting the production of pasture and hay crops. A site should be selected on better suited soils.

Woodland

Suitability: Moderately suited
Management concerns: Edneyville—erodibility and equipment use; Chestnut—erodibility, equipment use, and hazard of windthrow
Management measures and considerations:
- Using cable logging methods helps to overcome equipment limitations and prevent the acceleration of erosion resulting from the construction of roads and skid trails.
- Periodically harvesting windthrown trees that result from high winds and a limited rooting depth can increase productivity in areas of the Chestnut soil.
- Managing the natural regeneration of hardwoods is the best method of reforestation.

Urban Development

Dwellings

Suitability: Unsuited
Management concerns:
- The slope and the depth to bedrock are severe limitations affecting dwellings. A site should be selected on better suited soils.

Septic tank absorption fields

Suitability: Unsuited
Management concerns:
- The slope and the depth to bedrock are severe limitations affecting septic tank absorption fields.
- The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Unsuited
Management concerns:
- The slope is a severe limitation affecting roads and streets. A site should be selected on better suited soils.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Based on eastern white pine as the indicator species, 12R in areas of the Edneyville soil and 10R in areas of the Chestnut soil

EvD—Evard-Cowee complex, 15 to 30 percent slopes, stony

Setting

Landscape: Mountain uplands
Landform: Stony ridges

Component location: Evard—concave, less stony areas; Cowee—convex, more stony areas
Shape of areas: Irregular
Size of areas: 10 to 250 acres

Composition

Evard soil and similar inclusions: 65 percent
Cowee soil and similar inclusions: 25 percent
Dissimilar inclusions: 10 percent

Typical Profile

Evard

Surface layer:
0 to 4 inches—brown sandy loam

Subsoil:
4 to 7 inches—strong brown sandy clay loam
7 to 21 inches—yellowish red clay loam
21 to 27 inches—yellowish red sandy clay loam that has strong brown mottles

Underlying material:
27 to 48 inches—saprolite consisting of yellowish red and strong brown sandy loam
48 to 65 inches—saprolite consisting of strong brown sandy loam

Cowee

Surface layer:
0 to 4 inches—dark brown gravelly sandy loam
4 to 6 inches—dark yellowish brown gravelly sandy loam

Subsoil:
6 to 19 inches—yellowish red sandy clay loam
19 to 25 inches—yellowish red gravelly sandy clay loam

Bedrock:
25 to 46 inches—soft, weathered biotite gneiss bedrock
46 inches—hard biotite gneiss bedrock

Soil Properties and Qualities

Depth class: Evard—very deep; Cowee—moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Evard—moderate; Cowee—low
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Moderately steep
Rock fragments: 0.01 to 0.1 percent surface coverage
Reaction: Evard—moderately acid to very strongly acid; Cowee—strongly acid to extremely acid
Depth to bedrock: Evard—greater than 60 inches; Cowee—20 to 40 inches to soft, weathered bedrock and typically 40 to 60 inches to hard bedrock

Inclusions

Dissimilar inclusions:
• Cliffield and Ashe soils that have hard bedrock at a depth of less than 40 inches and occur in landform positions similar to those of the Evard and Cowee soils
Similar inclusions:
• Soils that are similar to the Evard and Cowee soils but have a higher content of mica
• Soils that are similar to the Evard soil but have more clay in the subsoil

Use and Management

Major Uses: Woodland and dwellings

Agricultural Development

Cropland

Suitability: Poorly suited
Potential productivity: Low
Management concerns: Erodibility and equipment use
Management measures and considerations:
• It is difficult to successfully control erosion and maintain fertility through resource management systems in areas of these soils.
• Special equipment or planning may be needed to safely plant and harvest crops.

Pasture and hayland

Suitability for pasture: Moderately suited
Suitability for hayland: Poorly suited
Potential productivity: Moderate
Management concerns: Erodibility and equipment use
Management measures and considerations:
• Planting adapted species helps to ensure the production of high-quality forage and reduce the hazard of erosion.
• Special care is needed in renovating pastures and establishing seedbeds to prevent further erosion.
• Special equipment or planning may be needed to safely harvest or maintain forage.
• Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.

Woodland

Suitability: Evard—well suited; Cowee—moderately suited
Management concerns: Evard—equipment use and erodibility; Cowee—equipment use, erodibility, and hazard of windthrow
Management measures and considerations:
• Constructing roads, fire lanes, and skid trails on the contour helps to overcome the slope.

• Installing broad-based dips, water bars, and culverts helps to stabilize logging roads, skid trails, and landings.
• Reseeding all disturbed areas with adapted grasses and legumes helps to prevent erosion.
• Establishing a buffer zone of trees and shrubs in areas adjacent to streams helps to reduce siltation and provides shade for the water surface.
• Suitable access should be maintained for equipment used in the periodic salvage of windthrown trees.

Urban Development

Dwellings

Suitability: Poorly suited
Management concerns: Evard—slope; Cowee—slope and depth to bedrock
Management measures and considerations:
• Sites should be selected in areas where slopes are least restrictive to construction and equipment use.
• Designing structures so that they conform to the natural slope helps to improve soil performance.
• Special excavation equipment may be needed in areas of the Cowee soil.
• Vegetating cleared and graded areas as soon as possible or constructing silt fences helps to maintain soil stability and keep sediments onsite.

Septic tank absorption fields

Suitability: Poorly suited
Management concerns: Evard—restricted permeability and slope; Cowee—restricted permeability, slope, and depth to bedrock
Management measures and considerations:
• Onsite waste disposal systems may require special design.
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Poorly suited
Management concerns: Slope and frost action
Management measures and considerations:
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Vegetating cut and fill slopes as soon as possible after construction helps to stabilize the soil and prevents excessive erosion.
• Using suitable subgrade or base material helps to minimize the damage to roads and streets caused by frost heaving.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: Based on shortleaf pine as the indicator species, 8R in areas of the Evard soil and 7R in areas of the Cowee soil

EvE—Evard-Cowee complex, 30 to 50 percent slopes, stony

Setting

Landscape: Mountain uplands
Landform: Hill slopes and ridges
Component location: Evard—concave, less sloping areas; Cowee—convex, more sloping areas
Shape of areas: Irregular
Size of areas: 15 to 2,000 acres

Composition

Evard soil and similar inclusions: 65 percent
Cowee soil and similar inclusions: 25 percent
Dissimilar inclusions: 10 percent

Typical Profile

Evard

Surface layer:
0 to 4 inches—brown sandy loam

Subsoil:
4 to 7 inches—strong brown sandy clay loam
7 to 21 inches—yellowish red clay loam
21 to 27 inches—yellowish red sandy clay loam that has strong brown mottles

Underlying material:
27 to 48 inches—saprolite consisting of yellowish red and strong brown sandy loam
48 to 65 inches—saprolite consisting of strong brown sandy loam

Cowee

Surface layer:
0 to 4 inches—dark brown gravelly sandy loam
4 to 6 inches—dark yellowish brown gravelly sandy loam

Subsoil:
6 to 19 inches—yellowish red sandy clay loam
19 to 25 inches—yellowish red gravelly sandy clay loam

Bedrock:
25 to 46 inches—soft, weathered biotite gneiss bedrock
46 inches—hard biotite gneiss bedrock

Soil Properties and Qualities

Depth class: Evard—very deep; Cowee—moderately deep
Drainage class: Well drained

Permeability: Moderate
Available water capacity: Evard—moderate; Cowee—low
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Steep
Rock fragments: 0.01 to 0.1 percent surface coverage
Reaction: Evard—moderately acid to very strongly acid; Cowee—strongly acid to extremely acid
Depth to bedrock: Evard—greater than 60 inches; Cowee—20 to 40 inches to soft, weathered bedrock and typically 40 to 60 inches to hard bedrock

Inclusions

Dissimilar inclusions:
• Randomly scattered small areas of rock outcrops
• Cliffield and Ashe soils that have hard bedrock at a depth of less than 40 inches and occur in landform positions similar to those of the Evard and Cowee soils
• Greenlee soils in extremely bouldery areas
Similar inclusions:
• Soils that are similar to the Evard and Cowee soils but have a higher content of mica
• Soils that are similar to the Evard soil but have more clay in the subsoil

Use and Management

Major Uses: Woodland

Agricultural Development

Cropland

Suitability: Unsuited
Management concerns:
• The slope is a severe limitation affecting crop production. A site should be selected on better suited soils.

Pasture and hayland

Suitability for pasture: Poorly suited
Suitability for hayland: Unsuited
Potential productivity: Low
Management concerns: Erodibility and equipment use
Management measures and considerations:
• Special equipment or planning may be needed to safely harvest or maintain forage.
• Applying lime, fertilizer, seed, and herbicides by hand helps to increase productivity in the steeper areas.

Woodland

Suitability: Moderately suited
Management concerns: Evard—equipment use and erodibility; Cowee—equipment use, erodibility, and hazard of windthrow
Management measures and considerations:
• Constructing roads, fire lanes, and skid trails on the contour helps to overcome the slope.
• Installing broad-based dips, water bars, and culverts helps to stabilize logging roads, skid trails, and landings.
• Reseeding all disturbed areas with adapted grasses and legumes helps to prevent erosion.
• Suitable access should be maintained for equipment used in the periodic salvage of windthrown trees.
• Establishing a buffer zone of trees and shrubs in areas adjacent to streams helps to reduce siltation and provides shade for the water surface.
• Managing the natural regeneration of hardwoods is the best method of reforestation.

Urban Development

Dwellings

Suitability: Poorly suited
Management concerns: Evard—slope; Cowee—slope and depth to bedrock
Management measures and considerations:
• Sites should be selected in areas where slopes are least restrictive to construction and equipment use.
• Special building designs or high excavation costs may be required.
• Special excavation equipment may be needed in areas of the Cowee soil.

Septic tank absorption fields

Suitability: Evard—poorly suited; Cowee—unsuited
Management concerns: Evard—slope; Cowee—slope and depth to bedrock
Management measures and considerations:
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Poorly suited
Management concerns: Slope and frost action
Management measures and considerations:
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Using suitable subgrade or base material helps to minimize the damage to roads and streets caused by frost heaving.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Based on shortleaf pine as

the indicator species, 8R in areas of the Evard soil and 7R in areas of the Cowee soil

EvF—Evard-Cowee complex, 50 to 85 percent slopes, stony

Setting

Landscape: Mountain uplands
Landform: Stony hill slopes
Component location: Evard—concave, less sloping areas; Cowee—convex, more sloping areas
Shape of areas: Irregular
Size of areas: 20 to 1,500 acres

Composition

Evard soil and similar inclusions: 55 percent
Cowee soil and similar inclusions: 30 percent
Dissimilar inclusions: 15 percent

Typical Profile

Evard

Surface layer:
0 to 4 inches—brown sandy loam

Subsoil:
4 to 7 inches—strong brown sandy clay loam
7 to 21 inches—yellowish red clay loam
21 to 27 inches—yellowish red sandy clay loam that has strong brown mottles

Underlying material:
27 to 48 inches—saprolite consisting of yellowish red and strong brown sandy loam
48 to 65 inches—saprolite consisting of strong brown sandy loam

Cowee

Surface layer:
0 to 4 inches—dark brown gravelly sandy loam
4 to 6 inches—dark yellowish brown gravelly sandy loam

Subsoil:
6 to 19 inches—yellowish red sandy clay loam
19 to 25 inches—yellowish red gravelly sandy clay loam

Bedrock:
25 to 46 inches—soft, weathered biotite gneiss bedrock
46 inches—hard biotite gneiss bedrock

Soil Properties and Qualities

Depth class: Evard—very deep; Cowee—moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Evard—moderate; Cowee—low
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Very steep
Rock fragments: 0.01 to 0.1 percent surface coverage
Reaction: Evard—moderately acid to very strongly acid; Cowee—strongly acid to extremely acid
Depth to bedrock: Evard—greater than 60 inches; Cowee—20 to 40 inches to soft, weathered bedrock and typically 40 to 60 inches to hard bedrock

Inclusions

Dissimilar inclusions:
- Randomly scattered small areas of rock outcrops
- Cleveland soils that have hard bedrock at a depth of less than 20 inches and occur near small areas of rock outcrops
- Ashe soils that have hard bedrock at a depth of less than 40 inches and occur in landform positions similar to those of the Evard and Cowee soils
- Greenlee soils in extremely bouldery areas

Similar inclusions:
- Soils that are similar to the Evard and Cowee soils but have a higher content of mica
- Soils that are similar to the Evard and Cowee soils but have less clay in the subsoil

Use and Management

Major Uses: Woodland

Agricultural Development

Cropland

Suitability: Unsuited
Management concerns:
- The slope is a severe limitation affecting crop production. A site should be selected on better suited soils.

Pasture and hayland

Suitability: Unsuited
Management concerns:
- The slope is a severe limitation affecting the production of pasture and hay crops. A site should be selected on better suited soils.

Woodland

Suitability: Moderately suited
Management concerns: Evard—equipment use and erodibility; Cowee—equipment use, erodibility, and hazard of windthrow

Management measures and considerations:
• Using cable logging methods helps to overcome equipment limitations and prevent the acceleration of erosion resulting from the construction of roads and skid trails.
• Periodically harvesting windthrown trees that result from high winds and a limited rooting depth can increase productivity in areas of the Cowee soil.
• Managing the natural regeneration of hardwoods is the best method of reforestation.

Urban Development

Dwellings

Suitability: Unsuited
Management concerns:
• The slope and the depth to bedrock are severe limitations affecting dwellings. A site should be selected on better suited soils.

Septic tank absorption fields

Suitability: Unsuited
Management concerns:
• The slope and the depth to bedrock are severe limitations affecting septic tank absorption fields.
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Unsuited
Management concerns:
• The slope is a severe limitation affecting local roads and streets. A site should be selected on better suited soils.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Based on shortleaf pine as the indicator species, 8R in areas of the Evard soil and 7R in areas of the Cowee soil

FcD—Fannin-Cowee complex, 15 to 30 percent slopes, stony

Setting

Landscape: Mountain uplands
Landform: Stony ridges
Component location: Fannin—concave, less stony areas; Cowee—convex, more stony areas
Shape of areas: Irregular
Size of areas: 15 to 250 acres

Composition

Fannin soil and similar inclusions: 75 percent
Cowee soil and similar inclusions: 15 percent
Dissimilar inclusions: 10 percent

Typical Profile

Fannin

Surface layer:
0 to 2 inches—dark brown fine sandy loam
2 to 4 inches—yellowish brown fine sandy loam

Subsoil:
4 to 16 inches—yellowish red clay loam
16 to 26 inches—yellowish red sandy clay loam
26 to 34 inches—red and yellowish red sandy clay loam that has dark reddish brown pockets of fine sandy loam

Underlying material:
34 to 52 inches—saprolite consisting of fine sandy loam in shades of red or brown that has a high content of mica
52 to 65 inches—saprolite consisting of fine sandy loam in shades of brown or yellow that has a high content of mica

Cowee

Surface layer:
0 to 4 inches—dark brown gravelly sandy loam
4 to 6 inches—dark yellowish brown gravelly sandy loam

Subsoil:
6 to 19 inches—yellowish red sandy clay loam
19 to 25 inches—yellowish red gravelly sandy clay loam

Bedrock:
25 to 46 inches—soft, weathered migmatitic gneiss bedrock
46 inches—hard migmatitic gneiss bedrock

Soil Properties and Qualities

Depth class: Fannin—very deep; Cowee—moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Fannin—moderate; Cowee—low
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Moderately steep
Rock fragments: 0.01 to 0.1 percent surface coverage
Reaction: Fannin—slightly acid to very strongly acid; Cowee—strongly acid to extremely acid
Depth to bedrock: Fannin—greater than 60 inches; Cowee—20 to 40 inches to soft, weathered bedrock and typically 40 to 60 inches to hard bedrock

Inclusions

Dissimilar inclusions:
• Ashe soils that have hard bedrock at a depth of less than 40 inches and occur in landform positions similar to those of the Fannin and Cowee soils
Similar inclusions:
• Soils that are similar to the Fannin soil but have a lower content of mica
• Soils that are similar to the Fannin soil but have more clay in the subsoil

Use and Management

Major Uses: Woodland, dwellings, and orchards

Agricultural Development

Cropland

Suitability: Poorly suited
Potential productivity: Low
Management concerns: Erodibility and equipment use
Management measures and considerations:
• It is difficult to successfully control erosion and maintain fertility through resource management systems in areas of these soils.
• Special equipment or planning may be needed to safely plant and harvest crops.

Pasture and hayland

Suitability for pasture: Moderately suited
Suitability for hayland: Poorly suited
Potential productivity: Moderate
Management concerns: Erodibility and equipment use
Management measures and considerations:
• Planting adapted species helps to ensure the production of high-quality forage and reduce the hazard of erosion.
• Special care is needed in renovating pastures and establishing seedbeds to prevent further erosion.
• Special equipment or planning may be needed to safely harvest or maintain forage.
• Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.

Woodland

Suitability: Fannin—well suited; Cowee—moderately suited
Management concerns: Fannin—equipment use and erodibility; Cowee—equipment use, erodibility, and hazard of windthrow
Management measures and considerations:
• Constructing roads, fire lanes, and skid trails on the contour helps to overcome the slope.
• Installing broad-based dips, water bars, and culverts helps to stabilize logging roads, skid trails, and landings.
• Reseeding all disturbed areas with adapted grasses and legumes helps to prevent erosion.
• Establishing a buffer zone of trees and shrubs in areas adjacent to streams helps to reduce siltation and provides shade for the water surface.
• Suitable access should be maintained for equipment used in the periodic salvage of windthrown trees.

Urban Development

Dwellings

Suitability: Poorly suited
Management concerns: Fannin—slope and a very severe hazard of erosion; Cowee—slope and depth to bedrock
Management measures and considerations:
• Sites should be selected in areas where slopes are least restrictive to construction and equipment use.
• Designing structures so that they conform to the natural slope helps to improve soil performance.
• Special excavation equipment may be needed in areas of the Cowee soil.
• Vegetating cleared and graded areas as soon as possible or constructing silt fences helps to maintain soil stability and keep sediments onsite.
• Special methods may be needed to control erosion in bare areas following construction.

Septic tank absorption fields

Suitability: Poorly suited
Management concerns: Fannin—restricted permeability and slope; Cowee—restricted permeability, slope, and depth to bedrock
Management measures and considerations:
• Onsite waste disposal systems may require special design.
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Poorly suited
Management concerns: Slope, frost action, and a very severe hazard of erosion
Management measures and considerations:
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Vegetating cut and fill slopes as soon as possible after construction helps to stabilize the soil and prevents excessive erosion.
• Using suitable subgrade or base material helps to

minimize the damage to roads and streets caused by frost heaving.
• Special methods may be needed to control erosion in bare areas following construction.

Interpretive Groups

Land capability classification: Fannin—VIIe; Cowee—VIe
Woodland ordination symbol: Based on shortleaf pine as the indicator species, 8R in areas of the Fannin soil and 7R in areas of the Cowee soil

FcE—Fannin-Cowee complex, 30 to 50 percent slopes, stony

Setting

Landscape: Mountain uplands
Landform: Stony hill slopes and ridges
Component location: Fannin—concave, less sloping areas; Cowee—convex, more sloping areas
Shape of areas: Irregular
Size of areas: 15 to 2,500 acres

Composition

Fannin soil and similar inclusions: 75 percent
Cowee soil and similar inclusions: 15 percent
Dissimilar inclusions: 10 percent

Typical Profile

Fannin

Surface layer:
0 to 2 inches—dark brown fine sandy loam
2 to 4 inches—yellowish brown fine sandy loam

Subsoil:
4 to 16 inches—yellowish red clay loam
16 to 26 inches—yellowish red sandy clay loam
26 to 34 inches—yellowish red and red sandy clay loam that has dark reddish brown pockets of fine sandy loam

Underlying material:
34 to 52 inches—saprolite consisting of fine sandy loam in shades of red or brown that has a high content of mica
52 to 65 inches—saprolite consisting of fine sandy loam in shades of brown or yellow that has a high content of mica

Cowee

Surface layer:
0 to 4 inches—dark brown gravelly sandy loam
4 to 6 inches—dark yellowish brown gravelly sandy loam

Subsoil:
6 to 19 inches—yellowish red sandy clay loam
19 to 25 inches—yellowish red gravelly sandy clay loam

Bedrock:
25 to 46 inches—soft, weathered migmatitic gneiss bedrock
46 inches—hard migmatitic gneiss bedrock

Soil Properties and Qualities

Depth class: Fannin—very deep; Cowee—moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Fannin—moderate; Cowee—low
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Steep
Rock fragments: 0.01 to 0.1 percent surface coverage
Reaction: Fannin—slightly acid to very strongly acid; Cowee—strongly acid to extremely acid
Depth to bedrock: Fannin—greater than 60 inches; Cowee—20 to 40 inches to soft, weathered bedrock and typically 40 to 60 inches to hard bedrock

Inclusions

Dissimilar inclusions:
• Randomly scattered small areas of rock outcrops
• Ashe soils that have hard bedrock at a depth of less than 40 inches and occur in landform positions similar to those of the Fannin and Cowee soils
• Greenlee soils in extremely bouldery areas
Similar inclusions:
• Soils that are similar to the Fannin soil but have a lower content of mica
• Soils that are similar to the Fannin and Cowee soils but have more clay in the subsoil

Use and Management

Major Uses: Woodland and orchards

Agricultural Development

Cropland

Suitability: Unsuited
Management concerns:
• The slope is a severe limitation affecting crop production. A site should be selected on better suited soils.

Pasture and hayland

Suitability for pasture: Poorly suited

Suitability for hayland: Unsuited
Potential productivity: Low
Management concerns: Erodibility and equipment use
Management measures and considerations:
• Special equipment or planning may be needed to safely harvest or maintain forage.
• Applying lime, fertilizer, seed, and herbicides by hand helps to increase productivity in the steeper areas.

Woodland

Suitability: Moderately suited
Management concerns: Fannin—equipment use and erodibility; Cowee—equipment use, erodibility, and hazard of windthrow
Management measures and considerations:
• Constructing roads, fire lanes, and skid trails on the contour helps to overcome the slope.
• Installing broad-based dips, water bars, and culverts helps to stabilize logging roads, skid trails, and landings.
• Reseeding all disturbed areas with adapted grasses and legumes helps to prevent erosion.
• Suitable access should be maintained for equipment used in the periodic salvage of windthrown trees.
• Establishing a buffer zone of trees and shrubs in areas adjacent to streams helps to reduce siltation and provides shade for the water surface.
• Managing the natural regeneration of hardwoods is the best method of reforestation.

Urban Development

Dwellings

Suitability: Poorly suited
Management concerns: Fannin—slope and a very severe hazard of erosion; Cowee—slope and depth to bedrock
Management measures and considerations:
• Sites should be selected in areas where slopes are least restrictive to construction and equipment use.
• Special building designs or high excavation costs may be required.
• Special excavation equipment may be needed in areas of the Cowee soil.
• Special methods may be needed to control erosion in bare areas following construction.

Septic tank absorption fields

Suitability: Fannin—poorly suited; Cowee—unsuited
Management concerns: Fannin—slope; Cowee—slope and depth to bedrock
Management measures and considerations:
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Poorly suited
Management concerns: Slope, frost action, and a very severe hazard of erosion
Management measures and considerations:
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Using suitable subgrade or base material helps to minimize the damage to roads and streets caused by frost heaving.
• Special methods may be needed to control erosion in bare areas following construction.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Based on shortleaf pine as the indicator species, 8R in areas of the Fannin soil and 7R in areas of the Cowee soil

FcF—Fannin-Cowee complex, 50 to 85 percent slopes, stony

Setting

Landscape: Mountain uplands
Landform: Stony hill slopes
Component location: Fannin—concave, less sloping areas; Cowee—convex, more sloping areas
Shape of areas: Irregular
Size of areas: 20 to 650 acres

Composition

Fannin soil and similar inclusions: 65 percent
Cowee soil and similar inclusions: 20 percent
Dissimilar inclusions: 15 percent

Typical Profile

Fannin

Surface layer:
0 to 2 inches—dark brown fine sandy loam
2 to 4 inches—yellowish brown fine sandy loam

Subsoil:
4 to 16 inches—yellowish red clay loam
16 to 26 inches—yellowish red sandy clay loam
26 to 34 inches—red and yellowish red sandy clay loam that has dark reddish brown pockets of fine sandy loam

Underlying material:
34 to 52 inches—saprolite consisting of fine sandy loam in shades of red or brown that has a high content of mica

52 to 65 inches—saprolite consisting of fine sandy loam in shades of brown or yellow that has a high content of mica

Cowee

Surface layer:
0 to 4 inches—dark brown gravelly sandy loam
4 to 6 inches—dark yellowish brown gravelly sandy loam

Subsoil:
6 to 19 inches—yellowish red sandy clay loam
19 to 25 inches—yellowish red gravelly sandy clay loam

Bedrock:
25 to 46 inches—soft, weathered migmatitic gneiss bedrock
46 inches—hard migmatitic gneiss bedrock

Soil Properties and Qualities

Depth class: Fannin—very deep; Cowee—moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Fannin—moderate; Cowee—low
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Very steep
Rock fragments: 0.01 to 0.1 percent surface coverage
Reaction: Fannin—slightly acid to very strongly acid; Cowee—strongly acid to extremely acid
Depth to bedrock: Fannin—greater than 60 inches; Cowee—20 to 40 inches to soft, weathered bedrock and typically 40 to 60 inches to hard bedrock

Inclusions

Dissimilar inclusions:
- Randomly scattered small areas of rock outcrops
- Cleveland soils that have hard bedrock at a depth of less than 20 inches and occur near small areas of rock outcrops
- Ashe soils that have hard bedrock at a depth of less than 40 inches and occur in landform positions similar to those of the Fannin and Cowee soils
- Greenlee soils in extremely bouldery areas

Similar inclusions:
- Soils that are similar to the Fannin soil but have a lower content of mica
- Soils that are similar to the Fannin and Cowee soils but have less clay in the subsoil

Use and Management

Major Uses: Woodland

Agricultural Development

Cropland

Suitability: Unsuited
Management concerns:
- The slope is a severe limitation affecting crop production. A site should be selected on better suited soils.

Pasture and hayland

Suitability: Unsuited
Management concerns:
- The slope is a severe limitation affecting the production of pasture and hay crops. A site should be selected on better suited soils.

Woodland

Suitability: Moderately suited
Management concerns: Fannin—erodibility and equipment use; Cowee—erodibility, equipment use, and hazard of windthrow
Management measures and considerations:
- Using cable logging methods helps to overcome equipment limitations and prevent the acceleration of erosion resulting from the construction of roads and skid trails.
- Periodically harvesting windthrown trees that result from high winds and a limited rooting depth can increase productivity in areas of the Cowee soil.
- Managing the natural regeneration of hardwoods is the best method of reforestation.

Urban Development

Dwellings

Suitability: Unsuited
Management concerns:
- The slope and the depth to bedrock are severe limitations affecting dwellings. A site should be selected on better suited soils.

Septic tank absorption fields

Suitability: Unsuited
Management concerns:
- The slope and the depth to bedrock are severe limitations affecting septic tank absorption fields.
- The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Unsuited
Management concerns:
- The slope is a severe limitation affecting local roads and streets. A site should be selected on better suited soils.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Based on shortleaf pine as the indicator species, 8R in areas of the Fannin soil and 7R in areas of the Cowee soil

GrE—Grover loam, 25 to 45 percent slopes

Setting

Landscape: Piedmont uplands
Landform: Hill slopes
Shape of areas: Irregular
Size of areas: 15 to 600 acres

Composition

Grover soil and similar inclusions: 90 percent
Dissimilar inclusions: 10 percent

Typical Profile

Surface layer:
0 to 6 inches—brown loam

Subsoil:
6 to 20 inches—yellowish red loam
20 to 25 inches—yellowish red loam

Underlying material:
25 to 35 inches—saprolite consisting of strong brown sandy loam that has very dark brown streaks and a high content of mica
35 to 65 inches—saprolite consisting of multicolored sandy loam that has a high content of mica

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Steep
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Moderately acid to very strongly acid
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• Randomly scattered small areas of rock outcrops
• Ashlar soils that have hard bedrock at a depth of less than 40 inches and occur near small areas of rock outcrops

Similar inclusions:
• Soils that are similar to the Grover soil but have a lower content of mica
• Soils that are similar to the Grover soil but have more clay in the subsoil

Use and Management

Major Uses: Woodland

Agricultural Development

Cropland

Suitability: Unsuited
Management concerns:
• The slope is a severe limitation affecting crop production. A site should be selected on better suited soils.

Pasture and hayland

Suitability for pasture: Poorly suited
Suitability for hayland: Unsuited
Potential productivity: Low
Management concerns: Erodibility and equipment use
Management measures and considerations:
• Special equipment or planning may be needed to safely harvest or maintain forage.
• Applying lime, fertilizer, seed, and herbicides by hand helps to increase productivity in the steeper areas.

Woodland

Suitability: Moderately suited
Management concerns: Equipment use and erodibility
Management measures and considerations:
• Constructing roads, fire lanes, and skid trails on the contour helps to overcome the slope.
• Installing broad-based dips, water bars, and culverts helps to stabilize logging roads, skid trails, and landings.
• Reseeding all disturbed areas with adapted grasses and legumes helps to prevent erosion.
• Establishing a buffer zone of trees and shrubs in areas adjacent to streams helps to reduce siltation and provides shade for the water surface.

Urban Development

Dwellings

Suitability: Poorly suited
Management concerns: Slope and a very severe hazard of erosion
Management measures and considerations:
• Sites should be selected in areas where slopes are least restrictive to construction and equipment use.
• Special building designs or high excavation costs may be required.

• Special methods may be needed to control erosion in bare areas following construction.

Septic tank absorption fields

Suitability: Poorly suited
Management concerns: Slope
Management measures and considerations:
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Poorly suited
Management concerns: Slope and a very severe hazard of erosion
Management measures and considerations:
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Special methods may be needed to control erosion in bare areas following construction.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 8R, based on loblolly pine as the indicator species

HaC—Hayesville fine sandy loam, 8 to 15 percent slopes

Setting

Landscape: Mountain uplands
Landform: Broad ridges
Shape of areas: Irregular
Size of areas: 6 to 75 acres

Composition

Hayesville soil and similar inclusions: 90 percent
Dissimilar inclusions: 10 percent

Typical Profile

Surface layer:
0 to 7 inches—yellowish brown fine sandy loam

Subsoil:
7 to 10 inches—yellowish red clay loam
10 to 21 inches—red clay
21 to 38 inches—yellowish red clay loam

Underlying material:
38 to 56 inches—saprolite consisting of yellowish red loam that has pockets of clay loam
56 to 65 inches—saprolite consisting of fine sandy loam in shades of yellow, red, or brown

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Strongly sloping
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Moderately acid to extremely acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• Cowee soils that have soft, weathered bedrock at a depth of less than 40 inches and occur in landform positions similar to those of the Hayesville soil
Similar inclusions:
• Soils that are similar to the Hayesville soil but have a higher content of mica
• Soils that are similar to the Hayesville soil but have a browner subsoil
• Soils that are similar to the Hayesville soil but have a loamy subsoil

Use and Management

Major Uses: Woodland, urban development, orchards, and pasture and hayland

Agricultural Development

Cropland

Suitability: Moderately suited
Potential productivity: Moderately high
Management concerns: Erodibility and fertility
Management measures and considerations:
• Resource management systems that include conservation tillage, crop residue management, stripcropping, and sod-based rotations help to reduce the hazard of erosion, control runoff, and maximize water infiltration.
• Applying lime and fertilizer according to recommendations based on soil tests increases the availability of plant nutrients and helps to maximize productivity.

Pasture and hayland

Suitability for pasture: Well suited
Suitability for hayland: Moderately suited

Potential productivity: Moderately high
Management concerns: Erodibility and equipment use
Management measures and considerations:
• Planting adapted species helps to ensure the production of high-quality forage and reduce the hazard of erosion.
• Preparing seedbeds on the contour or across the slope helps to reduce the hazard of erosion and increase germination.
• The slope may limit equipment use in the steeper areas during the harvest of hay crops.
• Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.

Woodland

Suitability: Well suited
Management concerns:
• There are no significant limitations affecting woodland management.
Management measures and considerations:
• Planting the appropriate species, as recommended by a forester, helps to maximize productivity and ensure planting success.

Urban Development

Dwellings

Suitability: Moderately suited
Management concerns: Slope
Management measures and considerations:
• Designing structures so that they conform to the natural slope helps to improve soil performance.
• Grading or land shaping can divert upslope surface water away from foundations.
• Vegetating cleared and graded areas as soon as possible or constructing silt fences helps to maintain soil stability and keep sediments onsite.

Septic tank absorption fields

Suitability: Moderately suited
Management concerns: Restricted permeability and slope
Management measures and considerations:
• Increasing the size of the absorption field helps to improve the performance of the septic tank.
• Installing the distribution lines of septic systems during dry periods helps to prevent smearing and sealing of trench walls.
• Installing distribution lines on the contour helps to improve performance of septic tank absorption fields.

Local roads and streets

Suitability: Moderately suited
Management concerns: Low strength, slope, and frost action
Management measures and considerations:
• Providing sand and gravel and compacting roadbeds improve soil strength.
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Using suitable subgrade or base material helps to minimize the damage to roads and streets caused by frost heaving.
• Vegetating cut and fill slopes as soon as possible after construction helps to stabilize the soil and prevents excessive erosion.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 11A, based on eastern white pine as the indicator species

HaD—Hayesville fine sandy loam, 15 to 30 percent slopes

Setting

Landscape: Mountain uplands
Landform: Hill slopes and ridges
Shape of areas: Irregular
Size of areas: 10 to 250 acres

Composition

Hayesville soil and similar inclusions: 90 percent
Dissimilar inclusions: 10 percent

Typical Profile

Surface layer:
0 to 7 inches—yellowish brown fine sandy loam

Subsoil:
7 to 10 inches—yellowish red clay loam
10 to 21 inches—red clay
21 to 38 inches—yellowish red clay loam

Underlying material:
38 to 56 inches—saprolite consisting of yellowish red loam that has pockets of clay loam
56 to 65 inches—saprolite consisting of fine sandy loam in shades of yellow, red, or brown

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low

Extent of erosion: Slight
Slope class: Moderately steep
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Moderately acid to extremely acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• Cowee soils that have soft, weathered bedrock at a depth of less than 40 inches and occur in landform positions similar to those of the Hayesville soil
Similar inclusions:
• Soils that are similar to the Hayesville soil but have a higher content of mica
• Soils that are similar to the Hayesville soil but have a browner subsoil
• Soils that are similar to the Hayesville soil but have less clay in the subsoil

Use and Management

Major Uses: Woodland, dwellings, orchards, and pasture

Agricultural Development

Cropland

Suitability: Poorly suited
Potential productivity: Low
Management concerns: Erodibility, equipment use, and fertility.
Management measures and considerations:
• It is difficult to successfully control erosion and maintain fertility through resource management systems in areas of this soil.
• Special equipment or planning may be needed to safely plant and harvest crops.

Pasture and hayland

Suitability for pasture: Moderately suited
Suitability for hayland: Poorly suited
Potential productivity: Moderate
Management concerns: Erodibility and equipment use
Management measures and considerations:
• Planting adapted species helps to ensure the production of high-quality forage and reduce the hazard of erosion.
• Special care is needed in renovating pastures and establishing seedbeds to prevent further erosion.
• Special equipment or planning may be needed to safely harvest or maintain forage.
• Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.

Woodland

Suitability: Well suited
Management concerns: Equipment use and erodibility
Management measures and considerations:
• Constructing roads, fire lanes, and skid trails on the contour helps to overcome the slope.
• Installing broad-based dips, water bars, and culverts helps to stabilize logging roads, skid trails, and landings.
• Reseeding all disturbed areas with adapted grasses and legumes helps to prevent erosion.
• Establishing a buffer zone of trees and shrubs in areas adjacent to streams helps to reduce siltation and provides shade for the water surface.

Urban Development

Dwellings

Suitability: Poorly suited
Management concerns: Slope
Management measures and considerations:
• Sites should be selected in areas where slopes are least restrictive to construction and equipment use.
• Designing structures so that they conform to the natural slope helps to improve soil performance.
• Vegetating cleared and graded areas as soon as possible or constructing silt fences helps to maintain soil stability and keep sediments onsite.

Septic tank absorption fields

Suitability: Poorly suited
Management concerns: Restricted permeability and slope
Management measures and considerations:
• Onsite waste disposal systems may require special design.
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Poorly suited
Management concerns: Low strength, slope, and frost action
Management measures and considerations:
• Providing sand and gravel and compacting roadbeds improve soil strength.
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Vegetating cut and fill slopes as soon as possible after construction helps to stabilize the soil and prevents excessive erosion.
• Using suitable subgrade or base material helps to minimize the damage to roads and streets caused by frost heaving.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 11R, based on eastern white pine as the indicator species

HwB2—Hiwassee clay loam, 2 to 8 percent slopes, eroded

Setting

Landscape: Piedmont uplands
Landform: Stream terraces and ridges
Shape of areas: Irregular
Size of areas: 10 to 75 acres

Composition

Hiwassee soil and similar inclusions: 95 percent
Dissimilar inclusions: 5 percent

Typical Profile

Surface layer:
0 to 7 inches—dark reddish brown clay loam

Subsoil:
7 to 21 inches—dark red clay
21 to 46 inches—red clay
46 to 58 inches—red clay loam
58 to 65 inches—red clay loam that has yellowish red mottles

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Moderate
Slope class: Gently sloping
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Slightly acid to very strongly acid
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
- Randomly scattered areas of severely eroded soils that have a loamy subsoil and a high content of mica

Similar inclusions:
- Hiwassee soils that have a surface layer of slightly eroded sandy loam or loam
- Soils that are similar to the Hiwassee soil but have red colors throughout the subsoil
- Soils that are similar to the Hiwassee soil but have a browner subsoil
- Soils that are similar to the Hiwassee soil but have clayey textures extending below a depth of 60 inches
- Soils that are similar to the Hiwassee soil but are less acid

Use and Management

Major Uses: Cropland, pasture and hayland, and dwellings

Agricultural Development

Cropland

Suitability: Well suited
Potential productivity: Moderately high
Management concerns: Erodibility, tilth, and fertility
Management measures and considerations:
- Resource management systems that include conservation tillage, crop residue management, stripcropping, and sod-based rotations help to reduce the hazard of erosion, control surface runoff, and maximize water infiltration.
- Incorporating crop residue into the soil or leaving residue on the soil surface helps to minimize clodding and crusting and maximize water infiltration.
- Tilling only during dry periods helps to prevent clodding and crusting and increase water infiltration.
- Applying lime and fertilizer according to recommendations based on soil tests increases the availability of plant nutrients and helps to maximize productivity.

Pasture and hayland

Suitability: Well suited
Potential productivity: Moderately high
Management concerns: Erodibility
Management measures and considerations:
- Planting adapted species helps to ensure the production of high-quality forage and reduce the hazard of erosion.
- A rotational grazing system and a well-planned clipping and harvesting schedule help to keep the pasture in good condition and increase productivity.

Woodland

Suitability: Well suited
Management concerns: Equipment use and seedling survival
Management measures and considerations:
- Unsurfaced roads may be impassible during wet periods because of the high content of clay.
- Logging only during dry periods helps to prevent rutting and damage to tree roots as a result of compaction.

• Replanting may be needed because of seedling mortality.
• Planting seedlings during wet, cool periods helps to improve survival rates.

Urban Development

Dwellings

Suitability: Well suited
Management concerns:
• There are no significant limitations affecting dwellings.
Management measures and considerations:
• Vegetating cleared and graded areas as soon as possible or constructing silt fences helps to maintain soil stability and keep sediments onsite.

Septic tank absorption fields

Suitability: Moderately suited
Management concerns: Restricted permeability
Management measures and considerations:
• Increasing the size of the absorption field helps to improve the performance of the septic tank.
• Installing the distribution lines of septic systems during dry periods helps to prevent smearing and sealing of trench walls.

Local roads and streets

Suitability: Moderately suited
Management concerns: Low strength
Management measures and considerations:
• Providing sand and gravel and compacting roadbeds improve soil strength.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 7C, based on loblolly pine as the indicator species

HwC2—Hiwassee clay loam, 8 to 15 percent slopes, eroded

Setting

Landscape: Piedmont uplands
Landform: Stream terraces and hill slopes
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Composition

Hiwassee soil and similar inclusions: 90 percent
Dissimilar inclusions: 10 percent

Typical Profile

Surface layer:
0 to 7 inches—dark reddish brown clay loam

Subsoil:
7 to 21 inches—dark red clay
21 to 46 inches—red clay
46 to 58 inches—red clay loam
58 to 65 inches—red clay loam that has yellowish red mottles

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Moderate
Slope class: Strongly sloping
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Slightly acid to very strongly acid
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• Randomly scattered areas of severely eroded soils that have a loamy subsoil and a high content of mica
Similar inclusions:
• Hiwassee soils that have a surface layer of slightly eroded sandy loam or loam
• Soils that are similar to the Hiwassee soil but have red colors throughout the subsoil
• Soils that are similar to the Hiwassee soil but have a higher content of mica
• Soils that are similar to the Hiwassee soil but have a thinner subsoil
• Soils that are similar to the Hiwassee soil but are less acid

Use and Management

Major Uses: Cropland, pasture and hayland, and woodland

Agricultural Development

Cropland

Suitability: Moderately suited
Potential productivity: Moderate
Management concerns: Erodibility, tilth, and fertility
Management measures and considerations:
• Resource management systems that include

conservation tillage, crop residue management, stripcropping, and sod-based rotations help to reduce the hazard of erosion, control surface runoff, and maximize water infiltration.
• Incorporating crop residue into the soil or leaving residue on the soil surface helps to minimize clodding and crusting and maximize water infiltration.
• Tilling only during dry periods helps to prevent clodding and crusting and increase water infiltration.
• Applying lime and fertilizer according to recommendations based on soil tests increases the availability of plant nutrients and helps to maximize productivity.

Pasture and hayland

Suitability for pasture: Well suited
Suitability for hayland: Moderately suited
Potential productivity: Moderately high
Management concerns: Erodibility and equipment use
Management measures and considerations:
• Planting adapted species helps to ensure the production of high-quality forage and reduce the hazard of erosion.
• Preparing seedbeds on the contour or across the slope helps to reduce the hazard of erosion and increase germination.
• The slope may limit equipment use in the steeper areas during the harvest of hay crops.
• Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.

Woodland

Suitability: Well suited
Management concerns: Equipment use and seedling survival
Management measures and considerations:
• Unsurfaced roads may be impassible during wet periods because of the high content of clay.
• Logging only during dry periods helps to prevent rutting and damage to tree roots as a result of compaction.
• Replanting may be needed because of seedling mortality.
• Planting seedlings during wet, cool periods helps to improve survival rates.

Urban Development

Dwellings

Suitability: Moderately suited
Management concerns: Slope
Management measures and considerations:
• Designing structures so that they conform to the natural slope helps to improve soil performance.
• Grading or land shaping can divert upslope surface water away from foundations.
• Vegetating cleared and graded areas as soon as possible or constructing silt fences helps to maintain soil stability and keep sediments onsite.

Septic tank absorption fields

Suitability: Moderately suited
Management concerns: Restricted permeability and slope
Management measures and considerations:
• Increasing the size of the absorption field helps to improve the performance of the septic tank.
• Installing the distribution lines of septic systems during dry periods helps to prevent smearing and sealing of trench walls.
• Installing distribution lines on the contour helps to improve performance of septic tank absorption fields.

Local roads and streets

Suitability: Moderately suited
Management concerns: Low strength and slope
Management measures and considerations:
• Providing sand and gravel and compacting roadbeds improve soil strength.
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Vegetating cut and fill slopes as soon as possible after construction helps to stabilize the soil and prevents excessive erosion.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 7C, based on loblolly pine as the indicator species

MaC2—Madison sandy clay loam, 8 to 15 percent slopes, eroded

Setting

Landscape: Piedmont uplands
Landform: Ridges and hill slopes
Shape of areas: Irregular
Size of areas: 10 to 300 acres

Composition

Madison soil and similar inclusions: 85 percent
Dissimilar inclusions: 15 percent

Typical Profile

Surface layer:
0 to 6 inches—brown sandy clay loam

Subsoil:
6 to 21 inches—red clay
21 to 26 inches—red clay loam
26 to 37 inches—red clay loam

Underlying material:
37 to 65 inches—saprolite consisting of coarse sandy loam in shades of red, yellow, or brown that has a high content of mica

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Moderate
Slope class: Strongly sloping
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Moderately acid to very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• Bethlehem soils that have soft, weathered bedrock at a depth of less than 40 inches and occur in landform positions similar to those of the Madison soil
Similar inclusions:
• Madison soils that have a surface layer of slightly eroded sandy loam or loam
• Soils that are similar to the Madison soil but have a lower content of mica
• Soils that are similar to the Madison soil but have a thicker subsoil

Use and Management

Major Uses: Woodland, dwellings, and pasture and hayland

Agricultural Development

Cropland

Suitability: Moderately suited
Potential productivity: Moderate
Management concerns: Erodibility, tilth, and fertility
Management measures and considerations:
• Resource management systems that include conservation tillage, crop residue management, stripcropping, and sod-based rotations help to reduce the hazard of erosion, control surface runoff, and maximize water infiltration.
• Incorporating crop residue into the soil or leaving residue on the soil surface helps to minimize clodding and crusting and maximize water infiltration.
• Tilling only during dry periods helps to prevent clodding and crusting and increase water infiltration.
• Applying lime and fertilizer according to recommendations based on soil tests increases the availability of plant nutrients and helps to maximize productivity.

Pasture and hayland

Suitability for pasture: Well suited
Suitability for hayland: Moderately suited
Potential productivity: Moderately high
Management concerns: Erodibility and equipment use
Management measures and considerations:
• Planting adapted species helps to ensure the production of high-quality forage and reduce the hazard of erosion.
• Preparing seedbeds on the contour or across the slope helps to reduce the hazard of erosion and increase germination.
• The slope may limit equipment use in the steeper areas during the harvest of hay crops.
• Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.

Woodland

Suitability: Well suited
Management concerns: Equipment use and seedling survival
Management measures and considerations:
• Unsurfaced roads may be impassible during wet periods because of the high content of clay.
• Logging only during dry periods helps to prevent rutting and damage to tree roots as a result of compaction.
• Replanting may be needed because of seedling mortality.
• Planting seedlings during wet, cool periods helps to improve survival rates.

Urban Development

Dwellings

Suitability: Moderately suited
Management concerns: Slope and a very severe hazard of erosion for the underlying material
Management measures and considerations:
• Designing structures so that they conform to the natural slope helps to improve soil performance.
• Grading or land shaping can divert upslope surface water away from foundations.

• Vegetating cleared and graded areas as soon as possible or constructing silt fences helps to maintain soil stability and keep sediments onsite.
• Special methods may be needed to control erosion in bare areas following construction.

Septic tank absorption fields

Suitability: Moderately suited
Management concerns: Restricted permeability and slope
Management measures and considerations:
• Increasing the size of the absorption field helps to improve the performance of the septic tank.
• Installing the distribution lines of septic systems during dry periods helps to prevent smearing and sealing of trench walls.
• Installing distribution lines on the contour helps to improve performance of septic tank absorption fields.

Local roads and streets

Suitability: Moderately suited
Management concerns: Low strength, slope, and a very severe hazard of erosion for the underlying material
Management measures and considerations:
• Providing sand and gravel and compacting roadbeds improve soil strength.
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Vegetating cut and fill slopes as soon as possible after construction helps to stabilize the soil and prevents excessive erosion.
• Special methods may be needed to control erosion in bare areas following construction.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 7C, based on loblolly pine as the indicator species

MaD2—Madison sandy clay loam, 15 to 25 percent slopes, eroded

Setting

Landscape: Piedmont uplands
Landform: Ridges and hill slopes
Shape of areas: Irregular
Size of areas: 10 to 600 acres

Composition

Madison soil and similar inclusions: 85 percent
Dissimilar inclusions: 15 percent

Typical Profile

Surface layer:
0 to 6 inches—brown sandy clay loam

Subsoil:
6 to 21 inches—red clay
21 to 26 inches—red clay loam
26 to 37 inches—red clay loam

Underlying material:
37 to 65 inches—saprolite consisting of coarse sandy loam in shades of red, yellow, or brown that has a high content of mica

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Moderate
Slope class: Moderately steep
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Moderately acid to very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• Bethlehem soils that have soft, weathered bedrock at a depth of less than 40 inches and occur in landform positions similar to those of the Madison soil
Similar inclusions:
• Soils that are similar to the Madison soil but have a lower content of mica
• Soils that are similar to the Madison soil but have less clay in the subsoil

Use and Management

Major Uses: Woodland and pasture

Agricultural Development

Cropland

Suitability: Poorly suited
Potential productivity: Low
Management concerns: Erodibility, equipment use, tilth, and fertility
Management measures and considerations:
• It is difficult to successfully control erosion and maintain

fertility through resource management systems in areas of this soil.
• Special equipment or planning may be needed to safely plant and harvest crops.

Pasture and hayland

Suitability for pasture: Moderately suited
Suitability for hayland: Poorly suited
Potential productivity: Moderate
Management concerns: Erodibility and equipment use
Management measures and considerations:
• Planting adapted species helps to ensure the production of high-quality forage and reduce the hazard of erosion.
• Special care is needed in renovating pastures and establishing seedbeds to prevent further erosion.
• Special equipment or planning may be needed to safely harvest or maintain forage.
• Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.

Woodland

Suitability: Moderately suited
Management concerns: Equipment use, erodibility, and seedling survival
Management measures and considerations:
• Unsurfaced roads may be impassible during wet periods because of the high content of clay.
• Logging only during dry periods helps to prevent rutting and damage to tree roots as a result of compaction.
• Installing broad-based dips, water bars, and culverts helps to stabilize logging roads, skid trails, and landings.
• Reseeding all disturbed areas with adapted grasses and legumes helps to prevent erosion.
• Replanting may be needed because of seedling mortality.
• Planting seedlings during wet, cool periods helps to improve survival rates.
• Establishing a buffer zone of trees and shrubs in areas adjacent to streams helps to reduce siltation and provides shade for the water surface.

Urban Development

Dwellings

Suitability: Poorly suited
Management concerns: Slope and a very severe hazard of erosion for the underlying material
Management measures and considerations:
• Sites should be selected in areas where slopes are least restrictive to construction and equipment use.
• Designing structures so that they conform to the natural slope helps to improve soil performance.
• Vegetating cleared and graded areas as soon as possible or constructing silt fences helps to maintain soil stability and keep sediments onsite.
• Special methods may be needed to control erosion in bare areas following construction.

Septic tank absorption fields

Suitability: Poorly suited
Management concerns: Restricted permeability and slope
Management measures and considerations:
• Onsite waste disposal systems may require special design.
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Poorly suited
Management concerns: Low strength, slope, and a very severe hazard of erosion for the underlying material
Management measures and considerations:
• Providing sand and gravel and compacting roadbeds improve soil strength.
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Vegetating cut and fill slopes as soon as possible after construction helps to stabilize the soil and prevents excessive erosion.
• Special methods may be needed to control erosion in bare areas following construction.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 7R, based on loblolly pine as the indicator species

MsB—Masada sandy loam, 2 to 8 percent slopes

Setting

Landscape: Piedmont valleys
Landform: Stream terraces
Shape of areas: Irregular
Size of areas: 6 to 40 acres

Composition

Masada soil and similar inclusions: 95 percent
Dissimilar inclusions: 5 percent

Typical Profile

Surface layer:
0 to 9 inches—brown sandy loam

Subsoil:
9 to 18 inches—strong brown sandy clay loam

18 to 24 inches—yellowish red clay
24 to 31 inches—yellowish red clay that has red and brownish yellow mottles
31 to 40 inches—strong brown clay that has yellowish red and brownish yellow mottles
40 to 55 inches—brownish yellow sandy clay that has yellowish red mottles

Underlying material:
55 to 65 inches—multicolored sandy clay loam in shades of brown, yellow, or red

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Moderate
Extent of erosion: Slight
Slope class: Gently sloping
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Strongly acid or very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• The moderately well drained Dogue soils in the lower areas
• Steep soils on scarps adjacent to drainageways
Similar inclusions:
• Masada soils that have a surface layer of moderately eroded clay loam or sandy clay loam
• Soils that are similar to the Masada soil but are less acid
• Soils that are similar to the Masada soil but have a lower shrink-swell potential
• Soils that are similar to the Masada soil but have a red subsoil

Use and Management

Major Uses: Cropland, pasture and hayland, and woodland

Agricultural Development

Cropland

Suitability: Well suited
Potential productivity: High
Management concerns: Erodibility and fertility
Management measures and considerations:
• Terraces and diversions, stripcropping, contour farming, no-till farming, and crop residue management reduce the hazard of erosion, control runoff, and increase the infiltration of rainfall.
• Applying lime and fertilizer according to recommendations based on soil tests increases the availability of plant nutrients and helps to maximize productivity.

Pasture and hayland

Suitability: Well suited
Potential productivity: High
Management concerns:
• There are no significant limitations affecting the management of pasture and hayland.
Management measures and considerations:
• A rotational grazing system and a well-planned clipping and harvesting schedule help to keep the pasture in good condition and increase productivity.

Woodland

Suitability: Well suited
Management concerns:
• There are no significant limitations affecting woodland management.
Management measures and considerations:
• Planting the appropriate species, as recommended by a forester, helps to maximize productivity and ensure planting success.

Urban Development

Dwellings

Suitability: Moderately suited
Management concerns: Shrink-swell potential
Management measures and considerations:
• Reinforcing foundations or backfilling with coarse textured material helps to strengthen buildings and prevents damage caused by shrinking and swelling.
• Vegetating cleared and graded areas as soon as possible or constructing silt fences helps to maintain soil stability and keep sediments onsite.

Septic tank absorption fields

Suitability: Moderately suited
Management concerns: Restricted permeability
Management measures and considerations:
• Increasing the size of the absorption field helps to improve the performance of the septic tank.
• Installing the distribution lines of septic systems during dry periods helps to prevent smearing and sealing of trench walls.

Local roads and streets

Suitability: Poorly suited
Management concerns: Low strength
Management measures and considerations:
• Providing sand and gravel and compacting roadbeds improve soil strength.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 8A, based on loblolly pine as the indicator species

OsA—Ostin loamy sand, 1 to 3 percent slopes, occasionally flooded

Setting

Landscape: Mountain valleys
Landform: Narrow flood plains along streams that flow from extremely stony or bouldery mountain coves
Shape of areas: Long and narrow
Size of areas: 4 to 90 acres

Composition

Ostin soil and similar inclusions: 85 percent
Dissimilar inclusions: 15 percent

Typical Profile

Surface layer:
0 to 6 inches—dark brown loamy sand

Underlying material:
6 to 11 inches—dark yellowish brown loamy sand that has lenses of sand
11 to 22 inches—yellowish brown very cobbly coarse sand
22 to 28 inches—yellowish brown gravelly coarse sand
28 to 60 inches—yellowish brown extremely gravelly coarse sand

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Moderately well drained or well drained
Permeability: Rapid or very rapid
Available water capacity: Very low
Depth to high water table: 2.0 to 3.5 feet
Flooding: Occasional for very brief periods
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Nearly level
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Neutral to very strongly acid
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• Tate and Greenlee soils in the higher, extremely stony or extremely bouldery areas
• The somewhat poorly drained, loamy Arkaqua soils in depressions
• The loamy Dillard soils in the slightly higher, rarely flooded areas
• Sandy soils that have fewer rock fragments than the Ostin soil and are in similar landform positions
Similar inclusions:
• Ostin soils that have a loamy surface layer
• Soils that are similar to the Ostin soil but are excessively drained

Use and Management

Major Uses: Cropland, pasture, and woodland

Agricultural Development

Cropland

Suitability: Moderately suited
Potential productivity: Low
Management concerns: Flooding, equipment use, droughtiness, and leaching of nutrients
Management measures and considerations:
• Harvesting row crops as early as possible helps to reduce the risk of damage caused by flooding.
• Providing supplemental irrigation water and planting crop varieties adapted to droughty conditions help to increase crop production.
• Using fertilizer and herbicides in split applications helps to increase their effectiveness.
• The high content of rock fragments in the underlying material may limit tillage depth.
• Managing areas of this map unit for crop production is difficult because of the small size of the areas.

Pasture and hayland

Suitability: Moderately suited
Potential productivity: Low
Management concerns: Flooding, droughtiness, and leaching of nutrients
Management measures and considerations:
• Harvesting hay crops as early as possible helps to reduce the risk of damage caused by flooding.
• Escape routes to higher areas should be provided to livestock during periods of flooding.
• Providing supplemental irrigation water and planting crop varieties adapted to droughty conditions help to increase crop production.
• Using fertilizer and herbicides in split applications helps to increase their effectiveness.

• Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.

Woodland

Suitability: Well suited
Management concerns: Seedling survival
Management measures and considerations:
• Replanting may be needed because of seedling mortality.
• Planting seedlings during wet, cool periods helps to improve survival rates.

Urban Development

Dwellings

Suitability: Unsuited
Management concerns:
• The flooding is a severe limitation affecting dwellings. A site should be selected on better suited soils.

Septic tank absorption fields

Suitability: Unsuited
Management concerns:
• This map unit has severe limitations affecting septic tank absorption fields. A site should be selected on better suited soils.

Local roads and streets

Suitability: Unsuited
Management concerns:
• The flooding is a severe limitation affecting roads and streets. A site should be selected on better suited soils.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 8F, based on yellow-poplar as the indicator species

PaC2—Pacolet sandy clay loam, 8 to 15 percent slopes, eroded

Setting

Landscape: Piedmont uplands
Landform: Ridges and hill slopes
Shape of areas: Irregular
Size of areas: 10 to 350 acres

Composition

Pacolet soil and similar inclusions: 90 percent
Dissimilar inclusions: 10 percent

Typical Profile

Surface layer:
0 to 5 inches—brown sandy clay loam

Subsoil:
5 to 20 inches—red clay
20 to 29 inches—red clay loam
29 to 37 inches—red sandy clay loam

Underlying material:
37 to 65 inches—saprolite consisting of fine sandy loam in shades of red, yellow, or brown

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Moderate
Slope class: Strongly sloping
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Strongly acid or very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• Bethlehem soils that have soft, weathered bedrock at a depth of less than 40 inches and occur in landform positions similar to those of the Pacolet soil
Similar inclusions:
• Pacolet soils that have a surface layer of slightly eroded sandy loam
• Soils that are similar to the Pacolet soil but have a browner subsoil
• Soils that are similar to the Pacolet soil but have a higher content of mica
• Soils that are similar to the Pacolet soil but have a thicker subsoil

Use and Management

Major Uses: Woodland, pasture and hayland, cropland, orchards, and dwellings

Agricultural Development

Cropland

Suitability: Moderately suited
Potential productivity: Moderate

Management concerns: Erodibility, tilth, and fertility
Management measures and considerations:
• Resource management systems that include conservation tillage, crop residue management, stripcropping, and sod-based rotations help to reduce the hazard of erosion, control surface runoff, and maximize water infiltration.
• Incorporating crop residue into the soil or leaving residue on the soil surface helps to minimize clodding and crusting and maximize water infiltration.
• Tilling only during wet periods helps to prevent clodding and crusting and increase water infiltration.
• Applying lime and fertilizer according to recommendations based on soil tests increases the availability of plant nutrients and helps to maximize productivity.

Pasture and hayland

Suitability for pasture: Well suited
Suitability for hayland: Moderately suited
Potential productivity: Moderately high
Management concerns: Erodibility and equipment use
Management measures and considerations:
• Planting adapted species helps to ensure the production of high-quality forage and reduce the hazard of erosion.
• Preparing seedbeds on the contour or across the slope helps to reduce the hazard of erosion and increase germination.
• The slope may limit equipment use in the steeper areas during the harvest of hay crops.
• Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.

Woodland

Suitability: Well suited
Management concerns: Equipment use and seedling survival
Management measures and considerations:
• Unsurfaced roads may be impassible during wet periods because of the high content of clay.
• Logging only during dry periods helps to prevent rutting and damage to tree roots as a result of compaction.
• Replanting may be needed because of seedling mortality.
• Planting seedlings during wet, cool periods helps to improve survival rates.

Urban Development

Dwellings

Suitability: Moderately suited
Management concerns: Slope
Management measures and considerations:
• Designing structures so that they conform to the natural slope helps to improve soil performance.
• Grading or land shaping can divert upslope surface water away from foundations.
• Vegetating cleared and graded areas as soon as possible or constructing silt fences helps to maintain soil stability and keep sediments onsite.

Septic tank absorption fields

Suitability: Moderately suited
Management concerns: Restricted permeability and slope
Management measures and considerations:
• Increasing the size of the absorption field helps to improve the performance of the septic tank.
• Installing the distribution lines of septic systems during dry periods helps to prevent smearing and sealing of trench walls.
• Installing distribution lines on the contour helps to improve the performance of septic tank absorption fields.

Local roads and streets

Suitability: Moderately suited
Management concerns: Low strength and slope
Management measures and considerations:
• Providing sand and gravel and compacting roadbeds improve soil strength.
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Vegetating cut and fill slopes as soon as possible after construction helps to stabilize the soil and prevents excessive erosion.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 6C, based on shortleaf pine as the indicator species

PaD2—Pacolet sandy clay loam, 15 to 25 percent slopes, eroded

Setting

Landscape: Piedmont uplands
Landform: Ridges and hill slopes
Shape of areas: Irregular
Size of areas: 10 to 600 acres

Composition

Pacolet soil and similar inclusions: 90 percent
Dissimilar inclusions: 10 percent

Typical Profile

Surface layer:
0 to 5 inches—brown sandy clay loam

Subsoil:
5 to 20 inches—red clay
20 to 29 inches—red clay loam
29 to 37 inches—red sandy clay loam

Underlying material:
37 to 65 inches—saprolite consisting of fine sandy loam in shades of red, yellow, or brown

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Moderate
Slope class: Moderately steep
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Strongly acid or very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• Bethlehem soils that have soft, weathered bedrock at a depth of less than 40 inches and occur in landform positions similar to those of the Pacolet soil
Similar inclusions:
• Soils that are similar to the Pacolet soil but have a browner subsoil
• Soils that are similar to the Pacolet soil but have a higher content of mica
• Soils that are similar to the Pacolet soil but have less clay in the subsoil

Use and Management

Major Uses: Woodland, orchards, and pasture

Agricultural Development

Cropland

Suitability: Poorly suited
Potential productivity: Low
Management concerns: Erodibility, equipment use, tilth, and fertility
Management measures and considerations:
• It is difficult to successfully control erosion and maintain fertility through resource management systems in areas of this soil.
• Special equipment or planning may be needed to safely plant and harvest crops.

Pasture and hayland

Suitability for pasture: Moderately suited
Suitability for hayland: Poorly suited
Potential productivity: Moderate
Management concerns: Erodibility and equipment use
Management measures and considerations:
• Planting adapted species helps to ensure the production of high-quality forage and reduce the hazard of erosion.
• Special care is needed in renovating pastures and establishing seedbeds to prevent further erosion.
• Special equipment or planning may be needed to safely harvest or maintain forage.
• Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.

Woodland

Suitability: Moderately suited
Management concerns: Equipment use, erodibility, and seedling survival
Management measures and considerations:
• Unsurfaced roads may be impassible during wet periods because of the high content of clay.
• Logging only during dry periods helps to prevent rutting and damage to tree roots as a result of compaction.
• Installing broad-based dips, water bars, and culverts helps to stabilize logging roads, skid trails, and landings.
• Reseeding all disturbed areas with adapted grasses and legumes helps to prevent erosion.
• Replanting may be needed because of seedling mortality.
• Planting seedlings during wet, cool periods helps to improve survival rates.
• Establishing a buffer zone of trees and shrubs in areas adjacent to streams helps to reduce siltation and provides shade for the water surface.

Urban Development

Dwellings

Suitability: Poorly suited
Management concerns: Slope
Management measures and considerations:
• Sites should be selected in areas where slopes are least restrictive to construction and equipment use.
• Designing structures so that they conform to the natural slope helps to improve soil performance.
• Vegetating cleared and graded areas as soon as

possible or constructing silt fences helps to maintain soil stability and keep sediments onsite.

Septic tank absorption fields

Suitability: Poorly suited
Management concerns: Restricted permeability and slope
Management measures and considerations:
• Onsite waste disposal systems may require special design.
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Poorly suited
Management concerns: Low strength and slope
Management measures and considerations:
• Providing sand and gravel and compacting roadbeds improve soil strength.
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Vegetating cut and fill slopes as soon as possible after construction helps to stabilize the soil and prevents excessive erosion.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 6R, based on shortleaf pine as the indicator species

PbC2—Pacolet-Bethlehem complex, 8 to 15 percent slopes, eroded

Setting

Landscape: Piedmont uplands
Landform: Ridges and hill slopes
Component location: Pacolet—concave areas; Bethlehem—convex, gravelly areas
Shape of areas: Irregular
Size of areas: 10 to 300 acres

Composition

Pacolet soil and similar inclusions: 50 percent
Bethlehem soil and similar inclusions: 40 percent
Dissimilar inclusions: 10 percent

Typical Profile

Pacolet

Surface layer:
0 to 5 inches—brown sandy clay loam

Subsoil:
5 to 20 inches—red clay
20 to 29 inches—red clay loam
29 to 37 inches—red sandy clay loam

Underlying material:
37 to 65 inches—saprolite consisting of fine sandy loam in shades of red, yellow, or brown

Bethlehem

Surface layer:
0 to 4 inches—strong brown gravelly coarse sandy loam

Subsoil:
4 to 8 inches—yellowish red clay loam
8 to 18 inches—red clay
18 to 23 inches—red gravelly clay

Bedrock:
23 to 60 inches—soft, weathered sillimanite-mica schist bedrock

Soil Properties and Qualities

Depth class: Pacolet—very deep; Bethlehem—moderately deep
Drainage class: Well drained
Permeability: Moderate
Depth to high water table: Greater than 6 feet
Available water capacity: Pacolet—moderate; Bethlehem—low
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Moderate
Slope class: Strongly sloping
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Strongly acid or very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Depth to bedrock: Pacolet—greater than 60 inches; Bethlehem—20 to 40 inches to soft, weathered bedrock

Inclusions

Dissimilar inclusions:
• Cliffside soils that have hard bedrock at a depth of less than 40 inches and occur in very stony, convex areas
Similar inclusions:
• Pacolet soils that have a surface layer of slightly eroded sandy loam or gravelly sandy loam
• Bethlehem soils that have a surface layer of gravelly sandy clay loam or clay loam
• Soils that are similar to the Pacolet soil but have a higher content of mica

• Soils that are similar to the Pacolet soil but have a thicker subsoil

Use and Management

Major Uses: Woodland, dwellings, cropland, and pasture and hayland

Agricultural Development

Cropland

Suitability: Moderately suited
Potential productivity: Moderate
Management concerns: Erodibility, tilth, and fertility
Management measures and considerations:
• Resource management systems that include conservation tillage, crop residue management, stripcropping, and sod-based rotations help to reduce the hazard of erosion, control surface runoff, and maximize water infiltration.
• Incorporating crop residue into the soil or leaving residue on the soil surface helps to minimize clodding and crusting and maximize water infiltration.
• Tilling only during dry periods helps to prevent clodding and crusting and increase water infiltration.
• Applying lime and fertilizer according to recommendations based on soil tests increases the availability of plant nutrients and helps to maximize productivity.

Pasture and hayland

Suitability for pasture: Well suited
Suitability for hayland: Moderately suited
Potential productivity: Pacolet—moderately high; Bethlehem—moderate
Management concerns: Erodibility and equipment use
Management measures and considerations:
• Planting adapted species helps to ensure the production of high-quality forage and reduce the hazard of erosion.
• Preparing seedbeds on the contour or across the slope helps to reduce the hazard of erosion and increase germination.
• The slope may limit equipment use in the steeper areas during the harvest of hay crops.
• Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.

Woodland

Suitability: Well suited
Management concerns: Pacolet—equipment use and seedling survival; Bethlehem—equipment use, hazard of windthrow, and seedling survival
Management measures and considerations:
• Unsurfaced roads may be impassible during wet periods because of the high content of clay.
• Logging only during dry periods helps to prevent rutting and damage to tree roots as a result of compaction.
• Suitable access should be maintained for equipment used in the periodic salvage of windthrown trees.
• Replanting may be needed because of seedling mortality.
• Planting seedlings during wet, cool periods helps to improve survival rates.

Urban Development

Dwellings

Suitability: Moderately suited
Management concerns: Pacolet—slope; Bethlehem—slope and depth to bedrock
Management measures and considerations:
• Designing structures so that they conform to the natural slope helps to improve soil performance.
• Special excavation equipment may be needed in areas of the Bethlehem soil.
• Grading or land shaping can divert upslope surface water away from foundations.
• Vegetating cleared and graded areas as soon as possible or constructing silt fences helps to maintain soil stability and keep sediments onsite.

Septic tank absorption fields

Suitability: Pacolet—moderately suited; Bethlehem—poorly suited
Management concerns: Pacolet—restricted permeability and slope; Bethlehem—restricted permeability, slope, and depth to bedrock
Management measures and considerations:
• Increasing the size of the absorption field helps to improve the performance of the septic tank.
• Installing the distribution lines of septic systems during dry periods helps to prevent smearing and sealing of trench walls.
• Installing distribution lines on the contour helps to improve the performance of septic tank absorption fields.
• Onsite waste disposal systems in areas of the Bethlehem soil may require special design.
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Moderately suited
Management concerns: Low strength and slope

Management measures and considerations:
• Providing sand and gravel and compacting roadbeds improve soil strength.
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Vegetating cut and fill slopes as soon as possible after construction helps to stabilize the soil and prevents excessive erosion.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: Based on shortleaf pine as the indicator species, 6C in areas of the Pacolet soil and 6D in areas of the Bethlehem soil

PbD2—Pacolet-Bethlehem complex, 15 to 25 percent slopes, eroded

Setting

Landscape: Piedmont uplands
Landform: Hill slopes and ridges
Component location: Pacolet—concave areas; Bethlehem—convex, gravelly areas
Shape of areas: Irregular
Size of areas: 10 to 450 acres

Composition

Pacolet soil and similar inclusions: 50 percent
Bethlehem soil and similar inclusions: 40 percent
Dissimilar inclusions: 10 percent

Typical Profile

Pacolet

Surface layer:
0 to 5 inches—brown sandy clay loam

Subsoil:
5 to 20 inches—red clay
20 to 29 inches—red clay loam
29 to 37 inches—red sandy clay loam

Underlying material:
37 to 65 inches—saprolite consisting of fine sandy loam in shades of red, yellow, or brown

Bethlehem

Surface layer:
0 to 4 inches—strong brown gravelly coarse sandy loam

Subsoil:
4 to 8 inches—yellowish red clay loam
8 to 18 inches—red clay
18 to 23 inches—red gravelly clay

Bedrock:
23 to 60 inches—soft, weathered sillimanite-mica schist bedrock

Soil Properties and Qualities

Depth class: Pacolet—very deep; Bethlehem—moderately deep
Drainage class: Well drained
Permeability: Moderate
Depth to high water table: Greater than 6 feet
Available water capacity: Pacolet—moderate; Bethlehem—low
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Moderate
Slope class: Moderately steep
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Strongly acid or very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Depth to bedrock: Pacolet—greater than 60 inches; Bethlehem—20 to 40 inches to soft, weathered bedrock

Inclusions

Dissimilar inclusions:
• Cliffside soils that have hard bedrock at a depth of less than 40 inches and occur in very stony, convex areas
Similar inclusions:
• Pacolet soils that have a surface layer of slightly eroded sandy loam or gravelly sandy loam
• Bethlehem soils that have a surface layer of gravelly sandy clay loam or clay loam
• Soils that are similar to the Pacolet soil but have a higher content of mica
• Soils that are similar to the Pacolet soil but have a thicker subsoil

Use and Management

Major Uses: Woodland and pasture

Agricultural Development

Cropland

Suitability: Poorly suited
Potential productivity: Low
Management concerns: Erodibility, equipment use, tilth, and fertility
Management measures and considerations:
• It is difficult to successfully control erosion and maintain fertility through resource management systems in areas of these soils.
• Special equipment or planning may be needed to safely plant and harvest crops.

Pasture and hayland

Suitability for pasture: Moderately suited
Suitability for hayland: Poorly suited
Potential productivity: Moderate
Management concerns: Erodibility and equipment use
Management measures and considerations:
• Planting adapted species helps to ensure the production of high-quality forage and reduce the hazard of erosion.
• Special care is needed in renovating pastures and establishing seedbeds to prevent further erosion.
• Special equipment or planning may be needed to safely harvest or maintain forage.
• Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.

Woodland

Suitability: Moderately suited
Management concerns: Pacolet—equipment use, erodibility, and seedling survival; Bethlehem—equipment use, erodibility, hazard of windthrow, and seedling survival
Management measures and considerations:
• Unsurfaced roads may be impassible during wet periods because of the high content of clay.
• Logging only during dry periods helps to prevent rutting and damage to tree roots as a result of compaction.
• Installing broad-based dips, water bars, and culverts helps to stabilize logging roads, skid trails, and landings.
• Reseeding all disturbed areas with adapted grasses and legumes helps to prevent erosion.
• Suitable access should be maintained for equipment used in the periodic salvage of windthrown trees.
• Replanting may be needed because of seedling mortality.
• Planting seedlings during wet, cool periods helps to improve survival rates.
• Establishing a buffer zone of trees and shrubs in areas adjacent to streams helps to reduce siltation and provides shade for the water surface.

Urban Development

Dwellings

Suitability: Poorly suited
Management concerns: Pacolet—slope; Bethlehem—slope and depth to bedrock
Management measures and considerations:
• Sites should be selected in areas where slopes are least restrictive to construction and equipment use.
• Designing structures so that they conform to the natural slope helps to improve soil performance.
• Special excavation equipment may be needed in areas of the Bethlehem soil.
• Vegetating cleared and graded areas as soon as possible or constructing silt fences helps to maintain soil stability and keep sediments onsite.

Septic tank absorption fields

Suitability: Poorly suited
Management concerns: Pacolet—restricted permeability and slope; Bethlehem—restricted permeability, slope, and depth to bedrock
Management measures and considerations:
• Onsite waste disposal systems may require special design.
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Poorly suited
Management concerns: Low strength and slope
Management measures and considerations:
• Providing sand and gravel and compacting roadbeds improve soil strength.
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Vegetating cut and fill slopes as soon as possible after construction helps to stabilize the soil and prevents excessive erosion.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 6R, based on shortleaf pine as the indicator species

Pt—Pits, quarries

Setting

Landscape: Piedmont and mountains
Landform: Ridges and hill slopes
Shape of areas: Irregular
Size of areas: 5 to 15 acres

Composition

Pits: 95 percent
Dissimilar inclusions: 5 percent

Typical Profile

This map unit consists of open excavations from which soil material and commonly underlying material have been removed, exposing rock or other material that supports little vegetation. A typical pedon is not given due to the variable nature of the soil material.

Inclusions

Dissimilar inclusions:
• Small areas of Udorthents or unexcavated natural soils

Use and Management

Major Uses: Construction aggregate

Suitability for land use: None assigned
Management concerns: Slope, exposed bedrock, stoniness, and instability of the pit faces
Management measures and considerations:
• Onsite investigation is needed in planning the use and management of this map unit.

Interpretive Groups

Land capability classification: VIIIs
Woodland ordination symbol: None assigned

RnE—Rion sandy loam, 25 to 45 percent slopes

Setting

Landscape: Piedmont uplands
Landform: Hill slopes
Shape of areas: Irregular
Size of areas: 15 to 600 acres

Composition

Rion soil and similar inclusions: 85 percent
Dissimilar inclusions: 15 percent

Typical Profile

Surface layer:
0 to 4 inches—yellowish brown sandy loam

Subsoil:
4 to 10 inches—strong brown sandy clay loam
10 to 30 inches—yellowish red clay loam
30 to 38 inches—strong brown sandy clay loam that has yellowish red pockets of clay loam

Underlying material:
38 to 65 inches—saprolite consisting of strong brown sandy loam that has yellowish red mottles

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Steep
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Strongly acid or very strongly acid
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• Randomly scattered small areas of rock outcrops
• Ashlar and Cliffside soils that have hard bedrock at a depth of less than 40 inches and occur near small areas of rock outcrops or in very stony areas
Similar inclusions:
• Soils that are similar to the Rion soil but have a higher content of mica
• Soils that are similar to the Rion soil but have more clay in the subsoil

Use and Management

Major Uses: Woodland, orchards, and pasture

Agricultural Development

Cropland

Suitability: Unsuited
Management concerns:
• The slope is a severe limitation affecting crop production. A site should be selected on better suited soils.

Pasture and hayland

Suitability for pasture: Poorly suited
Suitability for hayland: Unsuited
Potential productivity: Low
Management concerns: Erodibility and equipment use
Management measures and considerations:
• Special equipment or planning may be needed to safely harvest or maintain forage.
• Applying lime, fertilizer, seed, and herbicides by hand helps to increase productivity in the steeper areas.

Woodland

Suitability: Moderately suited
Management concerns: Equipment use and erodibility
Management measures and considerations:
• Constructing roads, fire lanes, and skid trails on the contour helps to overcome the slope.
• Installing broad-based dips, water bars, and culverts helps to stabilize logging roads, skid trails, and landings.
• Reseeding all disturbed areas with adapted grasses and legumes helps to prevent erosion.
• Establishing a buffer zone of trees and shrubs in areas

adjacent to streams helps to reduce siltation and provides shade for the water surface.

Urban Development

Dwellings

Suitability: Poorly suited
Management concerns: Slope
Management measures and considerations:
• Sites should be selected in areas where slopes are least restrictive to construction and equipment use.
• Special building designs or high excavation costs may be required.

Septic tank absorption fields

Suitability: Poorly suited
Management concerns: Slope
Management measures and considerations:
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Poorly suited
Management concerns: Slope
Management measures and considerations:
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 8R, based on loblolly pine as the indicator species

RoF—Rion-Ashlar-Rock outcrop complex, 45 to 70 percent slopes

Setting

Landscape: Piedmont uplands
Landform: Stony hill slopes
Component location: Rion—areas away from rock outcrops; Ashlar—areas adjacent to rock outcrops; Rock outcrop—randomly scattered areas
Shape of areas: Irregular
Size of areas: 10 to 300 acres

Composition

Rion soil and similar inclusions: 50 percent
Ashlar soil and similar inclusions: 20 percent
Rock outcrop: 15 percent
Dissimilar inclusions: 15 percent

Typical Profile

Rion

Surface layer:
0 to 4 inches—yellowish brown sandy loam

Subsoil:
4 to 10 inches—strong brown sandy clay loam
10 to 30 inches—yellowish red clay loam
30 to 38 inches—strong brown sandy clay loam that has yellowish red pockets of clay loam

Underlying material:
38 to 65 inches—saprolite consisting of strong brown sandy loam that has yellowish red mottles

Ashlar

Surface layer:
0 to 5 inches—yellowish brown gravelly sandy loam

Subsoil:
5 to 24 inches—strong brown sandy loam

Bedrock:
24 inches—hard biotite gneiss bedrock

Soil Properties and Qualities

Depth class: Rion—very deep; Ashlar—moderately deep
Drainage class: Rion—well drained; Ashlar—excessively drained
Permeability: Rion—moderate; Ashlar—moderately rapid
Available water capacity: Rion—moderate; Ashlar—low
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Very steep
Rock fragments: 0.01 to 0.1 percent surface coverage
Reaction: Strongly acid or very strongly acid
Depth to bedrock: Rion—greater than 60 inches; Ashlar—20 to 40 inches to hard bedrock

Inclusions

Dissimilar inclusions:
• Soils that have hard bedrock at a depth of less than 20 inches and occur in areas adjacent to rock outcrops
• Cliffside soils that have more rock fragments in the subsoil than the Rion and Ashlar soils and are in convex, very stony areas
Similar inclusions:
• Soils that are similar to the Rion and Ashlar soils but have a higher content of mica
• Soils that are similar to the Rion and Ashlar soils but have more clay in the subsoil

Use and Management

Major Uses: Woodland

Agricultural Development

Cropland

Suitability: Unsuited
Management concerns:
• The slope, depth to bedrock, and rockiness are severe limitations affecting crop production. A site should be selected on better suited soils.

Pasture and hayland

Suitability: Unsuited
Management concerns:
• The slope, depth to bedrock, and rockiness are severe limitations affecting the production of pasture and hay crops. A site should be selected on better suited soils.

Woodland

Suitability: Moderately suited
Management concerns: Rion—erodibility and equipment use; Ashlar—erodibility, hazard of windthrow, and equipment use
Management measures and considerations:
• Using cable logging methods helps to overcome limitations, including the slope and the large amount of rock outcrops, that affect the construction of roads and trails.
• Periodically harvesting windthrown trees that result from high winds and a limited rooting depth can increase productivity in areas of the Ashlar soil.
• Where possible, roads and skid trails should be constructed on the contour in areas around rock outcrops.

Urban Development

Dwellings

Suitability: Unsuited
Management concerns:
• The slope, depth to bedrock, and rockiness are severe limitations affecting dwellings. A site should be selected on better suited soils.

Septic tank absorption fields

Suitability: Unsuited
Management concerns:
• The slope, depth to bedrock, and rockiness are severe limitations affecting septic tank absorption fields.
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Unsuited
Management concerns:
• The slope, depth to bedrock, and rockiness are severe limitations affecting roads and streets. A site should be selected on better suited soils.

Interpretive Groups

Land capability classification: Rion and Ashlar—VIIe; Rock outcrop—VIIIs
Woodland ordination symbol: Based on loblolly pine as the indicator species, 8R in areas of the Rion soil and 7R in areas of the Ashlar soil; Rock outcrop—none assigned

RtE—Rion-Cliffside complex, 25 to 45 percent slopes, very stony

Setting

Landscape: Piedmont uplands
Landform: Very stony hill slopes
Component location: Rion—concave, less stony areas; Cliffside—convex, very stony areas
Shape of areas: Irregular
Size of areas: 10 to 400 acres

Composition

Rion soil and similar inclusions: 75 percent
Cliffside soil and similar inclusions: 15 percent
Dissimilar inclusions: 10 percent

Typical Profile

Rion

Surface layer:
0 to 4 inches—yellowish brown sandy loam

Subsoil:
4 to 10 inches—strong brown sandy clay loam
10 to 30 inches—yellowish red clay loam
30 to 38 inches—strong brown sandy clay loam that has yellowish red pockets of clay loam

Underlying material:
38 to 65 inches—saprolite consisting of strong brown sandy loam that has yellowish red mottles

Cliffside

Surface layer:
0 to 2 inches—dark brown gravelly sandy loam
2 to 5 inches—dark yellowish brown gravelly sandy loam

Subsoil:
5 to 18 inches—strong brown very cobbly sandy clay loam
18 to 28 inches—yellowish red very cobbly sandy clay loam

Bedrock:
28 inches—hard sillimanite-mica schist bedrock

Soil Properties and Qualities

Depth class: Rion—very deep; Cliffside—moderately deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Rion—moderate; Cliffside—low
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Steep
Rock fragments: 0.1 to 3.0 percent surface coverage
Reaction: Strongly acid or very strongly acid
Depth to bedrock: Rion—greater than 60 inches; Cliffside—20 to 40 inches to hard bedrock

Inclusions

Dissimilar inclusions:
• Randomly scattered small areas of rock outcrops
• Ashlar soils that have fewer rock fragments in the subsoil than the Rion and Cliffside soils and are in similar landform positions
Similar inclusions:
• Soils that are similar to the Rion soil but have a higher content of mica
• Soils that are similar to the Rion soil but have more clay in the subsoil

Use and Management

Major Uses: Woodland and pasture

Agricultural Development

Cropland

Suitability: Unsuited
Management concerns:
• The slope and stoniness are severe limitations affecting crop production. A site should be selected on better suited soils.

Pasture and hayland

Suitability for pasture: Poorly suited
Suitability for hayland: Unsuited
Potential productivity: Rion—low; Cliffside—very low
Management concerns: Rion—erodibility and equipment use; Cliffside—erodibility, equipment use, and droughtiness
Management measures and considerations:
• Special equipment or planning may be needed to safely harvest or maintain forage.
• Applying lime, fertilizer, seed, and herbicides by hand helps to increase productivity in the steeper areas.
• All surface stones large enough to interfere with the management of forage and livestock should be removed.

Woodland

Suitability: Moderately suited
Management concerns: Rion—equipment use and erodibility; Cliffside—equipment use, erodibility, and hazard of windthrow
Management measures and considerations:
• Constructing roads, fire lanes, and skid trails on the contour helps to overcome the slope.
• Installing broad-based dips, water bars, and culverts helps to stabilize logging roads, skid trails, and landings.
• Reseeding all disturbed areas with adapted grasses and legumes helps to prevent erosion.
• Establishing a buffer zone of trees and shrubs in areas adjacent to streams helps to reduce siltation and provides shade for the water surface.
• Suitable access should be maintained for equipment used in the periodic salvage of windthrown trees.

Urban Development

Dwellings

Suitability: Rion—poorly suited; Cliffside—unsuited
Management concerns: Rion—slope; Cliffside—slope, large stones, and depth to bedrock
Management measures and considerations:
• Sites should be selected in areas where slopes are least restrictive to construction and equipment use.
• Designing structures so that they conform to the natural slope helps to improve soil performance.
• Special earthmoving equipment or the drilling and blasting of rock may be needed in areas of the Cliffside soil.

Septic tank absorption fields

Suitability: Rion—poorly suited; Cliffside—unsuited
Management concerns: Rion—slope; Cliffside—slope, large stones, and depth to bedrock
Management measures and considerations:
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Poorly suited

Management concerns: Rion—slope; Cliffside—slope, large stones, and depth to bedrock
Management measures and considerations:
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Blasting or special grading equipment may be needed in constructing roads in areas of the Cliffside soil.

Interpretive Groups

Land capability classification: Rion—VIIe; Cliffside—VIIs
Woodland ordination symbol: Rion—8R, based on loblolly pine as the indicator species; Cliffside—6R, based on Virginia pine as the indicator species

RvA—Riverview loam, 0 to 2 percent slopes, occasionally flooded

Setting

Landscape: Piedmont valleys
Landform: Flood plains
Shape of areas: Long and narrow
Size of areas: 4 to 120 acres

Composition

Riverview soil and similar inclusions: 90 percent
Dissimilar inclusions: 10 percent

Typical Profile

Surface layer:
0 to 12 inches—dark brown loam

Subsoil:
12 to 29 inches—dark yellowish brown clay loam
29 to 51 inches—dark yellowish brown loam
51 to 60 inches—dark yellowish brown loam that has yellowish brown mottles

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: High
Depth to high water table: 3.0 to 5.0 feet
Flooding: Occasional for brief periods
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Nearly level
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Moderately acid to very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• The somewhat poorly drained Chewacla soils in depressions
• The sandy, excessively drained Buncombe soils adjacent to the stream channel
• The clayey Skyuka soils in the higher areas
Similar inclusions:
• Riverview soils that have a sandy surface layer
• Soils that are similar to the Riverview soil but have less clay in the subsoil

Use and Management

Major Uses: Cropland and pasture and hayland

Agricultural Development

Cropland

Suitability: Well suited
Potential productivity: Very high
Management concerns: Flooding
Management measures and considerations:
• Harvesting row crops as early as possible helps to reduce the risk of damage caused by flooding.

Pasture and hayland

Suitability: Well suited
Potential productivity: Very high
Management concerns: Flooding
Management measures and considerations:
• Harvesting hay crops as early as possible helps to reduce the risk of damage caused by flooding.
• Escape routes to higher areas should be provided to livestock during periods of flooding.
• Restricting use may be necessary after heavy rains when flooding is a hazard.
• Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.

Woodland

Suitability: Well suited
Management concerns:
• There are no significant limitations affecting woodland management.
Management measures and considerations:
• Planting the appropriate species, as recommended by a forester, helps to maximize productivity and ensure planting success.
• Establishing a buffer zone of trees and shrubs in areas adjacent to streams helps to reduce siltation and provides shade for the water surface.

Urban Development

Dwellings

Suitability: Unsuited
Management concerns:
• The flooding is a severe limitation affecting dwellings. A site should be selected on better suited soils.

Septic tank absorption fields

Suitability: Unsuited
Management concerns:
• The flooding and wetness are severe limitations affecting septic tank absorption fields. A site should be selected on better suited soils.

Local roads and streets

Suitability: Unsuited
Management concerns:
• The flooding is a severe limitation affecting roads and streets. A site should be selected on better suited soils.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 9A, based on yellow-poplar as the indicator species

SkB2—Skyuka clay loam, 2 to 8 percent slopes, eroded

Setting

Landscape: Piedmont valleys
Landform: Stream terraces
Shape of areas: Irregular
Size of areas: 6 to 25 acres

Composition

Skyuka soil and similar inclusions: 95 percent
Dissimilar inclusions: 5 percent

Typical Profile

Surface layer:
0 to 9 inches—dark brown clay loam

Subsoil:
9 to 30 inches—yellowish red clay loam
30 to 38 inches—yellowish red clay that has strong brown mottles
38 to 52 inches—yellowish red clay loam that has strong brown and red mottles
52 to 60 inches—strong brown sandy clay loam that has yellowish red iron masses and yellowish brown iron depletions

Underlying material:
60 to 72 inches—multicolored fine sandy loam in shades of yellow, red, gray, or brown

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: High
Depth to high water table: 4 to 6 feet
Flooding: None
Shrink-swell potential: Moderate
Extent of erosion: Moderate
Slope class: Gently sloping
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Slightly acid to strongly acid
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• The moderately well drained Dogue soils in the lower areas
Similar inclusions:
• Skyuka soils that have a surface layer of slightly eroded sandy loam or loam
• Soils that are similar to the Skyuka soil but have a redder subsoil
• Soils that are similar to the Skyuka soil but have a lower shrink-swell potential
• Soils that are similar to the Skyuka soil but are more acid
• Soils that are similar to the Skyuka soil but do not have a high water table within a depth of 6 feet

Use and Management

Major Uses: Cropland and pasture and hayland

Agricultural Development

Cropland

Suitability: Well suited
Potential productivity: High
Management concerns: Erodibility and tilth
Management measures and considerations:
• Resource management systems that include conservation tillage, crop residue management, stripcropping, and sod-based rotations help to reduce the hazard of erosion, control surface runoff, and maximize water infiltration.
• Incorporating crop residue into the soil or leaving residue on the soil surface helps to minimize clodding and crusting and maximize water infiltration.

• Tilling only during dry periods helps to prevent clodding and crusting and increase water infiltration.

Pasture and hayland

Suitability: Well suited
Potential productivity: High
Management concerns: Erodibility
Management measures and considerations:
• Planting adapted species helps to ensure the production of high-quality forage and reduce the hazard of erosion.
• A rotational grazing system and a well-planned clipping and harvesting schedule help to keep the pasture in good condition and increase productivity.

Woodland

Suitability: Well suited
Management concerns: Equipment use and seedling survival
Management measures and considerations:
• Unsurfaced roads may be impassible during wet periods because of the high content of clay.
• Logging only during dry periods helps to prevent rutting and damage to tree roots as a result of compaction.
• Replanting may be needed because of seedling mortality.
• Planting seedlings during wet, cool periods helps to improve survival rates.

Urban Development

Dwellings

Suitability: Moderately suited
Management concerns: Shrink-swell potential and wetness
Management measures and considerations:
• Reinforcing foundations or backfilling with coarse textured material helps to strengthen buildings and prevents damage caused by shrinking and swelling.
• Building structures on the highest part of the landscape and installing an artificial drainage system help to prevent damage caused by the wetness.
• Vegetating cleared and graded areas as soon as possible or constructing silt fences helps to maintain soil stability and keep sediments onsite.

Septic tank absorption fields

Suitability: Moderately suited
Management concerns: Restricted permeability and wetness
Management measures and considerations:
• Increasing the size of the absorption field helps to improve the performance of the septic tank.
• Installing the distribution lines of septic systems during dry periods helps to prevent smearing and sealing of trench walls.
• Additions of suitable fill material can raise the filter field a sufficient distance above the high water table and thus help to improve the performance of the septic tank.

Local roads and streets

Suitability: Poorly suited
Management concerns: Low strength
Management measures and considerations:
• Providing sand and gravel and compacting roadbeds improve soil strength.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 6C, based on yellow-poplar as the indicator species

TaC—Tate-Greenlee complex, 8 to 15 percent slopes, extremely stony

Setting

Landscape: Mountain uplands
Landform: Extremely stony coves and hill slopes
Component location: Tate—convex, less stony areas; Greenlee—concave, more stony areas
Shape of areas: Irregular
Size of areas: 15 to 65 acres

Composition

Tate soil and similar inclusions: 60 percent
Greenlee soil and similar inclusions: 30 percent
Dissimilar inclusions: 10 percent

Typical Profile

Tate

Surface layer:
0 to 4 inches—brown cobbly sandy loam
4 to 10 inches—light yellowish brown cobbly sandy loam

Subsoil:
10 to 24 inches—yellowish brown sandy clay loam
24 to 46 inches—strong brown sandy clay loam
46 to 70 inches—strong brown gravelly sandy loam that has pockets of loamy sand

Greenlee

Surface layer:
0 to 4 inches—dark brown cobbly sandy loam
4 to 11 inches—dark yellowish brown cobbly sandy loam

Subsoil:
11 to 27 inches—dark yellowish brown very cobbly sandy loam
27 to 51 inches—yellowish brown very cobbly sandy loam
51 to 74 inches—strong brown very cobbly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Tate—moderate; Greenlee—moderately rapid
Available water capacity: Tate—moderate; Greenlee—low
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Strongly sloping
Rock fragments: 3.0 to 15.0 percent surface coverage
Reaction: Tate—strongly acid or very strongly acid; Greenlee—strongly acid to extremely acid
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• Ostin soils in occasionally flooded areas adjacent to drainageways
Similar inclusions:
• Soils that are similar to the Tate and Greenlee soils but have more clay in the subsoil
• Soils that are similar to the Tate soil but have a redder subsoil
• Soils that are similar to the Tate and Greenlee soils but have a darker surface layer

Use and Management

Major Uses: Woodland, pasture, and dwellings

Agricultural Development

Cropland

Suitability: Tate—poorly suited; Greenlee—unsuited
Potential productivity: Tate—moderate
Management concerns: Erodibility and large stones
Management measures and considerations:
• Heavy equipment may be needed to remove large stones that interfere with cropland management.

Pasture and hayland

Suitability for pasture: Tate—moderately suited; Greenlee—unsuited
Suitability for hayland: Tate—poorly suited; Greenlee—unsuited
Potential productivity: Tate—moderately high
Management concerns: Slope and large stones
Management measures and considerations:
• Heavy equipment may be needed to remove large stones that interfere with the management of pasture and hayland.
• Areas of the better suited Tate soil may be too intermingled with areas of the Greenlee soil to be managed separately.

Woodland

Suitability: Well suited
Management concerns: Tate—no significant limitations; Greenlee—equipment limitations and seedling mortality
Management measures and considerations:
• Installing broad-based dips, water bars, and culverts helps to stabilize logging roads, skid trails, and landings.
• Reseeding all disturbed areas with adapted grasses and legumes helps to prevent erosion.
• Using cable logging methods helps to overcome the limitation caused by the large number of stones and boulders on the surface that affects the construction of roads and trails.
• Managing the natural regeneration of hardwoods is the best method of reforestation.

Urban Development

Dwellings

Suitability: Tate—moderately suited; Greenlee—poorly suited
Management concerns: Tate—slope; Greenlee—slope and large stones
Management measures and considerations:
• Designing structures so that they conform to the natural slope helps to improve soil performance.
• Specially designed retaining structures may be needed to stabilize excavation walls and cutbanks in areas of the Greenlee soil.
• Drainage systems may be needed around the foundation of dwellings to control seasonal springs and wetness.

Septic tank absorption fields

Suitability: Tate—moderately suited; Greenlee—poorly suited
Management concerns: Tate—slope and restricted permeability; Greenlee—slope and large stones
Management measures and considerations:
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Tate—moderately suited; Greenlee—poorly suited
Management concerns: Tate—slope and frost action; Greenlee—slope, large stones, and frost action
Management measures and considerations:
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Carefully planning the location of roads helps to minimize the removal of large stones.
• Using suitable subgrade or base material helps to minimize the damage to roads and streets caused by frost heaving.

Interpretive Groups

Land capability classification: Tate—IVs; Greenlee—VIIs
Woodland ordination symbol: Based on yellow-poplar as the indicator species, 6A in areas of the Tate soil and 8X in areas of the Greenlee soil

TaD—Tate-Greenlee complex, 15 to 30 percent slopes, extremely stony

Setting

Landscape: Mountain uplands
Landform: Extremely stony coves and hill slopes
Component location: Tate—convex, less stony areas; Greenlee—concave, more stony areas
Shape of areas: Irregular
Size of areas: 15 to 150 acres

Composition

Tate soil and similar inclusions: 60 percent
Greenlee soil and similar inclusions: 30 percent
Dissimilar inclusions: 10 percent

Typical Profile

Tate

Surface layer:
0 to 4 inches—brown cobbly sandy loam
4 to 10 inches—light yellowish brown cobbly sandy loam

Subsoil:
10 to 24 inches—yellowish brown sandy clay loam
24 to 46 inches—strong brown sandy clay loam
46 to 70 inches—strong brown gravelly sandy loam that has pockets of loamy sand

Greenlee

Surface layer:
0 to 4 inches—dark brown cobbly sandy loam
4 to 11 inches—dark yellowish brown cobbly sandy loam

Subsoil:
11 to 27 inches—dark yellowish brown very cobbly sandy loam
27 to 51 inches—yellowish brown very cobbly sandy loam
51 to 74 inches—strong brown very cobbly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Tate—moderate; Greenlee—moderately rapid
Available water capacity: Tate—moderate; Greenlee—low
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Moderately steep
Rock fragments: 3.0 to 15.0 percent surface coverage
Reaction: Tate—strongly acid or very strongly acid; Greenlee—strongly acid to extremely acid
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
• Ostin soils in occasionally flooded areas adjacent to drainageways
• Soils that have bedrock at a depth of less than 40 inches and occur in steep areas adjacent to drainageways
Similar inclusions:
• Soils that are similar to the Tate and Greenlee soils but have more clay in the subsoil
• Soils that are similar to the Tate soil but have a redder subsoil
• Soils that are similar to the Tate and Greenlee soils and have saprolite within a depth of 40 inches
• Soils that are similar to the Tate and Greenlee soils but have a darker surface layer

Use and Management

Major Uses: Woodland and dwellings

Agricultural Development

Cropland

Suitability: Unsuited
Management concerns:
• The slope and large stones are severe limitations

affecting crop production. A site should be selected on better suited soils.

Pasture and hayland

Suitability for pasture: Tate—poorly suited; Greenlee—unsuited
Suitability for hayland: Unsuited
Potential productivity: Tate—moderate
Management concerns: Slope and equipment use
Management measures and considerations:
• Heavy equipment may be needed to remove large stones that interfere with the management of pasture and hayland.
• Areas of the better suited Tate soil may be too intermingled with areas of the Greenlee soil to be managed separately.

Woodland

Suitability: Tate—well suited; Greenlee—moderately suited
Management concerns: Tate—erodibility and equipment use; Greenlee—erodibility, equipment limitations, and seedling mortality
Management measures and considerations:
• Installing broad-based dips, water bars, and culverts helps to stabilize logging roads, skid trails, and landings.
• Reseeding all disturbed areas with adapted grasses and legumes helps to prevent erosion.
• Using cable logging methods helps to overcome the limitation caused by the large number of stones and boulders on the surface that affects the construction of roads and trails.
• Managing the natural regeneration of hardwoods is the best method of reforestation.

Urban Development

Dwellings

Suitability: Poorly suited
Management concerns: Tate—slope; Greenlee—slope, large stones, and instability of the soil when disturbed
Management measures and considerations:
• Sites should be selected in areas where slopes and large stones are least restrictive to construction and equipment use.
• Designing structures so that they conform to the natural slope helps to improve soil performance.
• Specially designed retaining structures may be needed to stabilize excavation walls and cutbanks in areas of the Greenlee soil.
• Drainage systems may be needed around the foundation of dwellings to control seasonal springs and wetness.

Septic tank absorption fields

Suitability: Poorly suited
Management concerns: Tate—slope and restricted permeability; Greenlee—slope and large stones
Management measures and considerations:
• The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Poorly suited
Management concerns: Tate—slope and frost action; Greenlee—slope, large stones, frost action, and instability of the soil when disturbed
Management measures and considerations:
• Constructing roads on the contour and providing adequate water-control structures, such as culverts, help to maintain road stability.
• Special designs of roads and streets may be needed in areas of the Greenlee soil to control seepage and stabilize cutbanks.
• Carefully planning the location of roads helps to minimize the removal of large stones.

Interpretive Groups

Land capability classification: Tate—VIs; Greenlee—VIIs
Woodland ordination symbol: Based on yellow-poplar as the indicator species, 6R in areas of the Tate soil and 8X in areas of the Greenlee soil

TgE—Tate-Greenlee complex, 30 to 60 percent slopes, extremely bouldery

Setting

Landscape: Mountain uplands
Landform: Extremely bouldery coves and hill slopes (fig. 7)
Component location: Tate—convex, less bouldery areas; Greenlee—concave, more bouldery areas
Shape of areas: Irregular or long and narrow
Size of areas: 15 to 250 acres

Composition

Tate soil and similar inclusions: 50 percent
Greenlee soil and similar inclusions: 40 percent
Dissimilar inclusions: 10 percent

Typical Profile

Tate

Surface layer:
0 to 4 inches—brown cobbly sandy loam
4 to 10 inches—light yellowish brown cobbly sandy loam

Figure 7.—An area of Tate-Greenlee complex, 30 to 60 percent slopes, extremely bouldery. Stones and boulders are a major management concern for many land uses.

Subsoil:
10 to 24 inches—yellowish brown sandy clay loam
24 to 46 inches—strong brown sandy clay loam
46 to 70 inches—strong brown gravelly sandy loam that has pockets of loamy sand

Greenlee

Surface layer:
0 to 4 inches—dark brown cobbly sandy loam
4 to 11 inches—dark yellowish brown cobbly sandy loam

Subsoil:
11 to 27 inches—dark yellowish brown very cobbly sandy loam
27 to 51 inches—yellowish brown very cobbly sandy loam
51 to 74 inches—strong brown very cobbly sandy loam

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Well drained
Permeability: Tate—moderate; Greenlee—moderately rapid
Available water capacity: Tate—moderate; Greenlee—low
Depth to high water table: Greater than 6 feet
Flooding: None
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Steep
Rock fragments: 3.0 to 15.0 percent surface coverage
Reaction: Tate—strongly acid or very strongly acid; Greenlee—strongly acid to extremely acid
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
- Small areas of rock outcrops adjacent to drainageways
- Soils that have bedrock at a depth of less than 40 inches and occur in areas adjacent to drainageways or rock outcrops

Similar inclusions:
- Soils that are similar to the Tate and Greenlee soils but have more clay in the subsoil
- Soils that are similar to the Tate soil but have a redder subsoil
- Soils that are similar to the Tate and Greenlee soils and have saprolite within a depth of 40 inches
- Soils that are similar to the Tate and Greenlee soils but have a darker surface layer

Use and Management

Major Uses: Woodland and dwellings

Agricultural Development

Cropland

Suitability: Unsuited
Management concerns:
- The slope and large stones are severe limitations affecting crop production. A site should be selected on better suited soils.

Pasture and hayland

Suitability: Unsuited
Management concerns:
- The slope and large stones are severe limitations affecting pasture and hayland. A site should be selected on better suited soils.

Woodland

Suitability: Moderately suited
Management concerns: Tate—erodibility and equipment limitations; Greenlee—erodibility, equipment limitations, and seedling mortality
Management measures and considerations:
- Installing broad-based dips, water bars, and culverts helps to stabilize logging roads, skid trails, and landings.
- Reseeding all disturbed areas with adapted grasses and legumes helps to prevent erosion.
- Using cable logging methods helps to overcome the limitation caused by the large number of stones and boulders on the surface that affects the construction of roads and trails.
- Managing the natural regeneration of hardwoods is the best method of reforestation.

Urban Development

Dwellings

Suitability: Tate—poorly suited; Greenlee—unsuited
Management concerns: Tate—slope; Greenlee—slope, large stones, and instability of the soil when disturbed
Management measures and considerations:
- Sites should be selected in areas where slopes and large stones are least restrictive to construction and equipment use.
- Designing structures so that they conform to the natural slope helps to improve soil performance.
- Specially designed retaining structures may be needed to stabilize excavation walls and cutbanks.
- Drainage systems may be needed around the foundation of dwellings to control seasonal springs and wetness.

Septic tank absorption fields

Suitability: Tate—poorly suited; Greenlee—unsuited
Management concerns: Tate—slope; Greenlee—slope and large stones
Management measures and considerations:
- The local Health Department should be contacted for guidance in developing sanitary facilities.

Local roads and streets

Suitability: Poorly suited
Management concerns: Tate—slope and frost action; Greenlee—slope, large stones, frost action, and instability of the soil when disturbed
Management measures and considerations:
- Constructing roads on the contour and providing

adequate water-control structures, such as culverts, help to maintain road stability.
• Special designs of roads and streets may be needed in areas of the Greenlee soil to control seepage and stabilize cutbanks.
• Carefully planning the location of roads helps to minimize the removal of boulders.
• Using suitable subgrade or base material helps to minimize the damage to roads and streets caused by frost heaving.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: Based on yellow-poplar as the indicator species, 6R in areas of the Tate soil and 8R in areas of the Greenlee soil

Ud—Udorthents, loamy

Setting

Landscape: Piedmont and mountain uplands
Landform: Ridges and hill slopes
Shape of areas: Irregular
Size of areas: 6 to 50 acres

Composition

Udorthents: 85 percent
Dissimilar inclusions: 15 percent

Typical Profile

This map unit consists of areas where natural soils have been greatly altered by excavation or intensive grading or covered by earthy fill material. The soils are variable in color and depth. They are predominantly loamy. A typical pedon was not given due to the variable nature of the soil material.

Soil Properties and Qualities

Depth class: Shallow to very deep
Drainage class: Somewhat excessively drained to moderately well drained
Permeability: Very slow to moderately rapid
Available water capacity: Low to high
Depth to high water table: 1.5 feet to greater than 6 feet
Flooding: None
Shrink-swell potential: Low or moderate
Slope class: Nearly level to extremely steep
Rock fragments: Less than 0.01 percent to 50 percent surface coverage
Reaction: Slightly acid to extremely acid
Depth to bedrock: 10 inches to greater than 60 inches

Inclusions

Dissimilar inclusions:
• Randomly scattered areas of exposed bedrock
• Small areas of natural soils that have not been greatly altered
• Areas where the surface has been covered with asphalt, concrete, buildings, or other impervious material

Use and Management

Major Uses: Landfills, borrow areas, and urban development

Suitability for land use: None assigned
Management concerns: Variable soil properties and qualities
Management measures and considerations:
• Onsite investigation is needed in planning the use and management of this map unit.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: None assigned

UoB—Udorthents, loamy, 0 to 5 percent slopes, rarely flooded

Setting

Landscape: Piedmont and mountain valleys
Landform: Flood plains
Shape of areas: Irregular
Size of areas: 6 to 30 acres

Composition

Udorthents: 85 percent
Dissimilar inclusions: 15 percent

Typical Profile

This map unit consists of areas along flood plains where natural soils have been greatly altered by cutting, filling, mining, or shaping. The soils are variable in color and depth. They are predominantly loamy. A typical pedon was not given due to the variable nature of the soil material.

Soil Properties and Qualities

Depth class: Deep or very deep
Drainage class: Somewhat excessively drained to somewhat poorly drained
Permeability: Very slow to moderately rapid
Available water capacity: Low to high
Depth to high water table: 0.5 foot to greater than 6 feet

Flooding: Rare
Shrink-swell potential: Low or moderate
Slope class: Nearly level or gently sloping
Rock fragments: Less than 0.01 percent to 15 percent surface coverage
Reaction: Slightly acid to extremely acid
Depth to bedrock: 10 inches to greater than 60 inches

Inclusions

Dissimilar inclusions:
- Small areas of natural soils that have not been altered
- Areas where the surface has been covered with asphalt, concrete, buildings, or other impervious material
- Udorthents in the higher areas that are not subject to flooding

Use and Management

Major Uses: Borrow areas and urban development

Suitability for land use: None assigned
Management concerns: Variable soil properties and qualities
Management measures and considerations:
- Onsite investigation is needed in planning the use and management of this map unit.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: None assigned

WeA—Wehadkee loam, 0 to 2 percent slopes, frequently flooded

Setting

Landscape: Piedmont valleys
Landform: Flood plains
Shape of areas: Long and narrow or irregular
Size of areas: 4 to 130 acres

Composition

Wehadkee soil and similar inclusions: 85 percent
Dissimilar inclusions: 15 percent

Typical Profile

Surface layer:
0 to 9 inches—strong brown and very dark gray loam
9 to 13 inches—dark gray loam that has dark brown iron concentrations

Subsoil:
13 to 29 inches—dark gray silt loam that has strong brown iron concentrations
29 to 54 inches—dark gray silty clay loam that has dark yellowish brown iron concentrations

Underlying material:
54 to 74 inches—gray stratified silty clay loam and loamy sand having dark yellowish brown iron concentrations

Soil Properties and Qualities

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderate
Available water capacity: High
High water table: Within a depth of 1.0 foot
Flooding: Frequent for brief to long periods
Shrink-swell potential: Low
Extent of erosion: Slight
Slope class: Nearly level
Rock fragments: Less than 0.01 percent surface coverage
Reaction: Slightly acid to very strongly acid
Depth to bedrock: Greater than 60 inches

Inclusions

Dissimilar inclusions:
- The somewhat poorly drained Chewacla soils in landform positions that are similar to those of the Wehadkee soil
- The clayey Roanoke soils in the higher areas

Similar inclusions:
- Wehadkee soils that have a sandy surface layer
- Soils that are similar to the Wehadkee soil but have less clay in the subsoil
- Soils that are similar to the Wehadkee soil but have more silt in the subsoil

Use and Management

Major Uses: Woodland

Agricultural Development

Cropland

Suitability: Unsuited
Management concerns:
- The flooding and wetness are severe limitations affecting crop production. A site should be selected on better suited soils.

Pasture and hayland

Suitability: Poorly suited
Potential productivity: Low
Management concerns: Flooding and wetness

Management measures and considerations:
• Forage species that are tolerant of excessive wetness should be planted in undrained areas.
• Fencing livestock away from creeks and streams helps to prevent the caving of streambanks, sedimentation, and contamination from animal waste.
• Federal and State regulations protecting wetlands may restrict the use of drainage systems and other alterations in areas of this map unit.

Woodland

Suitability: Moderately suited
Management concerns: Equipment use and plant competition
Management measures and considerations:
• Using low-pressure ground equipment helps to prevent rutting and damage to tree roots as a result of compaction.
• Harvesting timber during summer helps to reduce the risk of damage caused by flooding.
• Site preparation practices, such as chopping, prescribed burning, and applications of herbicide, help to reduce competition from unwanted plants.
• Trees that are tolerant of wetness should be planted.
• Federal and State regulations protecting wetlands may restrict the use of drainage systems and other alterations in areas of this map unit.

Urban Development

Dwellings

Suitability: Unsuited
Management concerns:
• The flooding and wetness are severe limitations affecting dwellings. A site should be selected on better suited soils.

Septic tank absorption fields

Suitability: Unsuited
Management concerns:
• The flooding and wetness are severe limitations affecting septic tank absorption fields. A site should be selected on better suited soils.

Local roads and streets

Suitability: Unsuited
Management concerns:
• The flooding and wetness are severe limitations affecting roads and streets. A site should be selected on better suited soils.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 8W, based on yellow-poplar as the indicator species

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Generally, the soils in Polk County that are well suited to crops, except for the soils subject to flooding, are also well suited to urban uses. The data concerning specific soils in the county can be used in planning future land use patterns. The potential for farming should be considered relative to any soil limitations and the potential for nonfarm development.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Marilyn M. Stowell, district conservationist, Natural Resources Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils are identified, the system of land capability classification used by the Natural Resources Conservation Service is explained, the estimated yields of the main crops and hay and pasture plants are listed for each soil, and prime farmland is described.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units" and in the tables. Specific information can be obtained from the local office of the Natural Resources Conservation Service or the North Carolina Cooperative Extension Service.

Federal and State regulations require that any area designated as wetlands cannot be altered without prior approval. Contact the local office of the Natural Resources Conservation Service for identification of hydric soils and potential wetlands.

In 1992, about 17,200 acres in Polk County were used for crops or pasture. Of this total, about 1,200 acres were used for crops, such as corn, soybeans, wheat, and other grains, and nearly 500 acres were used for vegetables, such as tomatoes (fig. 8), cabbage, squash, cucumbers, peppers, and snap beans. In 1992, about 1,300 acres were used for apple and peach orchards and 15,500 acres were used as pasture and hayland. Tall fescue, sericea lespedeza, orchardgrass, ladino clover, bermudagrass, and alfalfa are the main forage species.

The most productive soils for crops and pasture are nearly level or gently sloping, have good internal drainage and adequate available water capacity, and require minimum erosion control. Cropland management practices are necessary to increase or maintain soil productivity and lower the costs of crop production. These practices include erosion control, water management, maintaining soil fertility, and chemical weed control.

Some areas that are idle, wooded, or pastured have

Figure 8.—Tomatoes in an area of Riverview loam, 0 to 2 percent slopes, occasionally flooded. This soil is well suited to this crop, but occasional flooding can cause crop damage.

good potential for use as cropland. Food production could be increased considerably by applying the latest technology to all of the cropland in the survey area. The information in this soil survey can facilitate the application of such technology.

The latest information about crops and pasture can be obtained at the local office of the North Carolina Cooperative Extension Service or the Natural Resources Conservation Service.

Cropland

Management considerations on cropland in the county include controlling erosion, planning water management, improving soil fertility, applying a system of chemical weed control, and improving tilth.

Erosion control.—Water erosion is a major hazard on most of the soils used for crops or pasture in Polk County. It is a hazard on soils that have a slope of more than 2 percent. Bethlehem, Cecil, Hiwassee, Madison, and Pacolet soils are examples. As the slope increases, the hazard of erosion and the difficulty in controlling erosion also increase.

Loss of the surface layer through erosion is damaging. Soil productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil, including many of the soils on piedmont uplands in the survey area, and on soils that have a layer in or below the subsoil that limits the depth of the root zone, such as the bedrock in Bethlehem soils.

Erosion on farmland results in the sedimentation of streams. Controlling erosion minimizes the pollution of water caused by runoff carrying plant nutrients, soil particles, and plant residue. It improves the quality of water for municipal use, for recreation, and for fish and wildlife.

In many sloping areas of clayey soils, preparing a good seedbed is difficult because much or all of the original friable surface layer has been lost because of erosion. This degree of erosion is common on clayey soils on piedmont uplands.

Erosion-control practices provide a protective surface cover, help to control runoff, and increase the rate of water infiltration. A cropping system that keeps a plant cover on the surface for extended periods helps to minimize soil loss and maintain the productive capacity of the soil. In sloping areas, including forage crops of grasses and legumes in the cropping system helps to control erosion. The forage crops also add nitrogen to the soil and improve tilth.

Minimizing tillage and leaving crop residue on the surface increase the rate of water infiltration, reduce runoff, and help to control erosion. These practices can be effective on most of the soils in the survey area. In the more sloping areas that are used for corn or double cropped with soybeans, no-till farming is effective in controlling erosion.

Terraces and diversions shorten the length of slopes and thus minimize erosion caused by runoff. They are most effective on very deep, well drained soils that have regular slopes. These measures are less effective on soils that have irregular slopes because these soils would be excessively wet in the terrace channels, would have a clayey subsoil exposed in the terrace channels, or would have bedrock within a depth of 40 inches.

Contour farming and contour stripcropping help to control erosion on many of the soils in the survey area. They are best suited to soils that have smooth, uniform slopes, such as Cecil and Pacolet soils.

Information about erosion-control measures for each kind of soil is available at the local office of the Natural Resources Conservation Service.

Water management.—Water management involves limiting flood damage, improving subsurface drainage, and retaining soil moisture. All flood plain soils have a hazard of flooding. Flooding can be caused by runoff from adjacent slopes or by streambank overflow. Excessive surface water due to floods can delay the use of equipment and damage crops and forage. Tillage patterns can increase these problems by creating low areas and blocking surface water outlets. Such soils as Chewacla, Riverview, and Arkaqua soils are occasionally flooded but are commonly used for crops. Diversions, land smoothing, and waterways are effective in removing the excessive surface water caused by runoff from adjacent slopes. Flood-control structures, such as dikes and levees, help to control flooding from streambank overflow. Measures that completely overcome this flooding hazard, however, are generally too costly to consider.

Subsurface drainage is a moderate management concern on the somewhat poorly drained Chewacla and Arkaqua soils. It is a lesser concern on moderately well drained soils, such as Dogue and Dillard soils. The poorly drained Wehadkee and Roanoke soils have severe subsurface drainage problems and are generally not used for cropland. A high water table limits equipment use and crop selection. Soils that have a high water table generally warm up slowly in spring and are poorly aerated. Crops on these soils are commonly susceptible to disease and pest problems. Tile drains and open ditches can be used where suitable outlets are available to lower the water table and improve soil aeration. Undrained areas of Chewacla and Arkaqua soils are commonly planted to crops that tolerate wetness.

Managing drainage in conformance with regulations concerning wetlands may require special permits and extra planning. The local office of the Natural Resources Conservation Service should be contacted for identification of hydric soils and potential wetlands.

Retaining soil moisture is a severe management concern in areas of the droughty Buncombe and Ostin soils. Stream-fed irrigation systems and large-scale additions of organic matter are needed to improve the levels of available soil moisture. Unless irrigated, these soils are extremely limited as cropland. Upland soils, such as Cecil, Pacolet, and Hiwassee soils, are susceptible to droughtiness especially during summer. Generally, management practices that control erosion also help to conserve available soil moisture because they decrease surface runoff and lower evapotranspiration rates.

Soil fertility.—The soils in Polk County generally are low in natural fertility and are naturally acid. Additions of lime and fertilizer are needed for the production of most kinds of crops.

Liming requirements are a major concern on cropland. The acidity level in the soil affects the availability of many nutrients to plants and the activity of beneficial bacteria. Lime neutralizes exchangeable aluminum in the soil and thus counteracts the adverse effects of high levels of aluminum on many crops. Liming adds calcium (from calcitic lime) or calcium and magnesium (from dolomitic lime) to the soil.

A soil test is a guide to what amount and kind of lime should be used. The desired pH levels may differ, depending on the soil properties and the crop to be grown.

Nitrogen fertilizer is required for most crops. It is generally not required, however, for clover, in some

rotations of soybeans, and for alfalfa that is established. A reliable soil test is not available for predicting nitrogen requirements. Appropriate rates of nitrogen application are described in the section "Yields per Acre."

Soil tests can indicate the need for phosphorus and potassium fertilizer. They are needed because phosphorus and potassium tend to build up in the soil.

Chemical weed control.—The use of herbicides for weed control is a common practice on the cropland in Polk County. It decreases the need for tillage and is an integral part of modern farming. Selected soil properties, such as organic matter content and texture of the surface layer, affect the rate of herbicide application. Estimates of both of these properties were determined for the soils in this survey area. Table 14 shows a general range of organic matter content in the surface layer of the soils. The texture of the surface layer is shown in the USDA texture column in table 13.

In some areas the organic matter content projected for the different soils is outside the range shown in the table. The content can be higher in soils that have received large amounts of animal or manmade waste. Soils that have recently been brought into cultivation may have a higher content of organic matter in the surface layer than similar soils that have been cultivated for a long time. Conservation tillage can increase the content of organic matter in the surface layer. A lower content of organic matter is common where the surface layer has been partly or completely removed by erosion or land smoothing. Current soil tests should be used for specific organic matter determinations.

Tilth.—Soil tilth is an important factor in the germination of seeds and the infiltration of water into the soil. Soils having good tilth have a granular and porous surface layer.

Some of the soils in the survey area that are used for crops are eroded and have a surface layer of clay loam or sandy clay loam that is low in content of organic matter. These soils become cloddy if they are plowed outside a narrow, optimum range in moisture content. In addition, periods of heavy rainfall result in the formation of a crust on the surface. The crust is hard when dry and nearly impervious to water. It reduces the rate of water infiltration and increases the runoff rate. Regular additions of crop residue, manure, and other organic material can improve soil structure and minimize crusting.

Bethlehem soils in the survey area have poor tilth because of gravel in the surface layer. The content and size of the pebbles affect the use of tillage implements.

Stones and boulders are common in some of the colluvial soils in the mountains of the survey area. Areas of Tate and Greenlee soils contain rock fragments that prevent tillage. In most places it is too difficult to remove the rock fragments and manage cropland.

Pasture and Hayland

In 1994, Polk County had about 5,700 beef and dairy cattle *(11)*. Most of the pasture and hayland in the county supports a mixture of grasses and legumes (fig. 9). Most of the hay is grown in rotation with pasture. The harvested hay commonly is rolled into large, round bales or is used as grass silage.

Selection of forage species.—A successful livestock enterprise depends on a forage program that provides large quantities of good-quality feed. In most areas of hayland and pasture in Polk County, renovation, brush control, and measures that prevent overgrazing are needed.

The soils in the survey area vary widely in their ability to produce grasses and legumes because of differences in such properties as depth to bedrock or to other limiting layers, internal drainage, and available water capacity. The forage species selected for planting should be appropriate for the soil.

The nearly level and gently sloping, deep and very deep, well drained soils should be planted to the highest producing crops, such as corn silage, alfalfa, or a mixture of alfalfa and orchardgrass. Sod-forming grasses, such as tall fescue and orchardgrass, minimize erosion in the steeper areas. Alfalfa should be seeded with cool-season grasses in areas where the soil is at least 2 feet deep and is well drained. The moderately well drained and somewhat poorly drained soils are suited to clover-grass mixtures or to pure stands of clover or grasses. Legumes can be established through renovation in areas that support sod-forming grasses.

The intended use should be considered when forage species are selected. Selected species should provide maximum quality and versatility in the forage program. Legumes generally produce higher quality feed than grasses. They should be grown to the maximum possible extent. The taller legumes, such as alfalfa and red clover, are more versatile than the legumes that are used primarily for grazing, such as white clover. Orchardgrass and tall fescue are best suited to use as hay and silage.

Tall fescue is an important cool-season grass. It is suited to a wide range of soil conditions and is grown for both pasture and hay. The growth that occurs from August through November commonly accumulates in the field and is used for grazing in late fall and in winter. For maximum production, nitrogen fertilizer should be applied during the period when the grass is accumulating. The rate of application should be based on the desired level of production.

Warm-season grasses that are planted from early April through late May help to supplement the cool-season grasses, such as tall fescue. They grow well during warm periods, especially from mid-June through September,

Figure 9.—A well managed pasture of tall fescue and ladino clover on Cecil sandy clay loam, 2 to 8 percent slopes, eroded.

when the growth of cool-season grasses is slow. Examples of warm-season grasses are bermudagrass and bermudagrass hybrids.

Maintenance of pasture and hayland.—Renovation can increase forage yields in areas that have a good stand of grass. It includes partially destroying the sod, applying lime and fertilizer, and seeding desirable forage species. Adding legumes to the stand of grass provides high-quality feed. Legumes increase summer production and transfer nitrogen from the air into the soil. Under growing conditions, alfalfa can fix 200 to 300 pounds of nitrogen per acre per year, red clover can fix 100 to 200 pounds, and ladino clover can fix 100 to 150 pounds. An acre of annual forage legumes, such as sericea lespedeza or vetch, can fix 75 to 100 pounds of nitrogen per year.

Additional information about managing pasture and hayland can be obtained from the local office of the Natural Resources Conservation Service or the North Carolina Cooperative Extension Service.

Orchards

Polk County has favorable conditions for apple and peach production. Peaches grow best on the warmer piedmont soils. Apples are grown on both piedmont and mountain soils. Establishing and managing orchardlands require careful site selection, careful orchard layout, and maintenance planning. The fruits are grown for the fresh market and the juice market.

Site selection.—Apple and peach trees require deep, well drained soils and landscapes that provide protection from early season freezing. Other management considerations are the potential for onsite water storage

and site maintenance costs. Topography can affect the degree of freeze and wind damage, subsurface drainage, and orchard layout. Mountain landscapes have colder climates, which hinder peach production. In both piedmont and mountain areas, cold air generally moves from the higher, more sloping areas and collects on the lower landscapes. Most of the severe crop losses are caused by early season freezing, which damages buds and flowers. Orchards should be located on sloping soils that provide uniform air movement and have few obstructions to air movement so that the formation of cold air pockets is prevented. The soils on the lower stream terraces and flood plains do not have good air movement and commonly have wetness problems associated with a high water table *(8, 9)*.

On piedmont uplands, soils such as Cecil, Pacolet, Hiwassee, and Appling soils are commonly used for orchards. Bethlehem soils are also used, but they tend to be droughty and their depth can limit tree roots. Rion and Grover soils on steep piedmont uplands have good air movement, but they have slopes that can limit orchard layout, maintenance of access roads, and the use of equipment. Cliffside soils are very stony and have limitations affecting tree rooting depth and the use of equipment.

On mountain uplands, soils such as Hayesville, Evard, and Fannin soils are used for apple production. On very steep slopes, however, these soils are generally not used because of equipment limitations. Soils in coves and on foot slopes, such as Brevard soils, are also used for apple production in areas where air movement is adequate. Greenlee and Tate soils are extremely stony and bouldery and are difficult to manage because of equipment limitations.

Aspect and susceptibility to wind damage are other landscape considerations in mountain areas. Conditions on southern aspects may promote premature bud development and thus increase the risk of freeze damage. Cellular damage to tree trunks may also occur on southern aspects during winter. On the higher mountain ridges, some soils are droughty and have limitations affecting tree rooting depth. Trees and flowers in these areas are commonly exposed to excessive wind and ice damage.

Although most orchards in Polk County are not irrigated, water is sometimes used to limit freeze damage. Soils that are suited to water storage facilities are preferred for this management measure. Table 12 lists the limitations of soils in Polk County that affect pond reservoir areas.

Layout and maintenance.—Orchard layout and maintenance includes careful tree selection, row spacing, planning access roads, erosion control, and a soil fertility program. Tree size and variety can affect the cost of maintenance, stand density, and pollination success. Smaller trees are generally easier to maintain and can be planted in closer rows. Factors of tree variety, such as fruit marketability, time of bloom, and disease resistance, affect maintenance costs and fruit quality *(8, 9)*.

Row spacing and the planning of access roads are affected by the slope and equipment use requirements. Adequate row spacing can minimize the damage to trees caused by equipment during spraying, pruning, and harvesting operations. Establishing rows on the contour helps to control surface runoff and soil erosion and helps to maximize equipment use. Access roads should not have steep grades or switchbacks, which can limit equipment use and maintenance. Permanent vegetation should be established and maintained on all access roads and in rows between the trees (fig. 10). Field borders, grassed waterways, and diversions may be needed to control excessive surface runoff and erosion.

Managing productive orchards includes the control of diseases, insects, and weeds and a soil fertility program. Herbicides and pesticides should be used with the assistance of agricultural specialists. Improper use of these chemicals can lower pollination success and damage the quality of nearby water supplies. Most herbicides are applied in bands or on a tree-by-tree basis. The texture and organic matter content of the soil are properties that can affect herbicide effectiveness. Table 14 lists the range in organic matter content for the soils in Polk County. The surface textures of the soils are shown in table 13. Specific fertility requirements for orchard crops are best determined by leaf analysis. Permanent vegetation on access roads and between trees should be limed and fertilized and otherwise maintained in good condition to prevent soil erosion, damage to access roads, and the sedimentation of nearby supplies of surface water.

The local office of the Natural Resources Conservation Service or the North Carolina Cooperative Service can provide additional information about the establishment and management of orchardland in Polk County.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and

Figure 10.—An area of Cecil sandy clay loam, 2 to 8 percent slopes, eroded. Maintaining permanent vegetation of tall fescue between the rows of peach trees helps to control runoff and erosion and improve accessibility for equipment.

results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

A high level of management includes maintaining proper soil reaction and fertility levels as indicated by standard soil tests. The application rate of nitrogen for corn on soils that have a yield potential of 125 to 150 bushels per acre should be 140 to 160 pounds per acre. If the yield potential for corn is 100 bushels per acre or less, a rate of 100 to 120 pounds of nitrogen per acre should

be used. The application of nitrogen in excess of that required for potential yields generally is not recommended. The excess nitrogen fertilizer that is not utilized by the crop is an unnecessary expense and causes a hazard of water pollution. If corn is grown after the harvest of soybeans, nitrogen rates can be reduced by about 20 to 30 pounds per acre. Because nitrogen can be readily leached from sandy soils, applications may be needed on these soils more than once during the growing season.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or the North Carolina Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops *(18)*. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode, but they have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless a close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in table 5.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. Generally, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable

temperature and growing season, acceptable levels of acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from 0 to 8 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 21,410 acres in the survey area, or about 14 percent of the total acreage, meets the soil requirements for prime farmland. The crops grown on this land include corn, soybeans, small grains, vegetables, and hay and pasture plants.

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed below. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures used to overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

The map units that meet the requirements for prime farmland are:

ApB	Appling sandy loam, 2 to 6 percent slopes
ArA	Arkaqua loam, 0 to 2 percent slopes, occasionally flooded (where drained)
CeB2	Cecil sandy clay loam, 2 to 8 percent slopes, eroded
ChA	Chewacla loam, 0 to 2 percent slopes, occasionally flooded (where drained)
DdB	Dillard sandy loam, 1 to 6 percent slopes, rarely flooded
HwB2	Hiwassee clay loam, 2 to 8 percent slopes, eroded
MsB	Masada sandy loam, 2 to 8 percent slopes
RvA	Riverview loam, 0 to 2 percent slopes, occasionally flooded
SkB2	Skyuka clay loam, 2 to 8 percent slopes, eroded

Woodland Management and Productivity

Albert Coffey, forester, Natural Resources Conservation Service, helped prepare this section.

Owners of woodland in Polk County have many objectives. These objectives include producing timber; conserving wildlife, soil, and water; preserving esthetic values; and providing opportunities for recreational activities, such as commercial hunting. Public demand for clean water and recreational areas creates pressures and opportunities for owners of woodland.

For purposes of forest inventory, the predominant forest types identified in Polk County are as described in the following paragraphs *(16)*.

Loblolly-Virginia pine. This forest type covers 30,208 acres. It is predominantly more than 50 percent loblolly pine or Virginia pine (usually not in combination). Commonly included trees are yellow-poplar, maple, black cherry, and gum.

Oak-pine. This forest type covers 33,381 acres. It is predominantly hardwoods, usually upland oaks. Pine species make up 25 to 50 percent of the stand. Commonly included trees are gum, hickory, maple, and yellow-poplar.

Oak-hickory. This forest type covers 50,371 acres. It is predominantly upland oaks or hickory, or both. Commonly included trees are yellow-poplar, gum, maple, and shortleaf pine.

The landowner interested in timber production is faced with the challenge of producing greater yields from smaller areas. Meeting this challenge requires intensive management and silvicultural practices. Many modern silvicultural techniques resemble those long practiced in agriculture. They include establishing, weeding, and thinning a desirable young stand; propagating the more productive species and genetic varieties; providing short rotations and complete fiber utilization; controlling insects, diseases, and weeds; and improving tree growth by applications of fertilizer and the installation of a drainage system. Even though timber crops require decades to grow, the goal of intensive management is similar to the goal of intensive agriculture. This goal is to produce the greatest yield of the most valuable crop as quickly as possible.

Commercial forests cover about 113,960 acres, or about 75 percent of the land area of Polk County *(16)*. According to the North Carolina Forest Service, about 69,024 acres of this forest land are privately owned, 40,014 acres are owned by the forest industry and corporations, and 4,922 acres are State and public lands. Commercial forest is land that is producing or is capable of producing crops of industrial wood and that has not been withdrawn from timber production. In Polk County,

foresters encourage landowners to manage for pine instead of hardwoods on sites that are suited to pine. Quality pine can be produced more rapidly and in greater volume than quality hardwoods. Local markets for pulpwood also encourage the demand for quality pine. Although loblolly pine does not grow naturally in the survey area, it is the most important timber species in the Piedmont part of the county because it grows fast, is adapted to the soils and climate, and is easy to establish and manage. Foresters commonly recommend managing for white pine on suitable mountain soils at elevations above 1,500 feet.

One of the first steps in planning intensive woodland management is to determine the potential productivity of the soil for several alternative tree species. The most productive and valued trees are then selected for each soil type. Site and yield information enables a forest manager to estimate future wood supplies. These estimates are the basis of realistic decisions concerning expenses and profits associated with intensive woodland management, land acquisition, and industrial investments.

The potential productivity of woodland depends on physiography, soil properties, climate, and the effects of past management. Specific soil properties and site characteristics, including soil depth, texture, structure, and depth to the water table, affect forest productivity primarily by influencing available water capacity, aeration, and root development. The net effects of the interaction of these soil properties and site characteristics determine the potential site productivity.

Other site factors are also important. The gradient and length of slopes affect water movement and availability. In mountainous areas, elevation and aspect affect the amount of sunlight a site receives and the rate of evaporation. Sites on south-facing slopes are warmer and drier than those on north-facing slopes. The best sites are generally on north- and east-facing slopes in the lower areas, in sheltered coves, and in gently sloping concave areas. The amount of rainfall and length of growing season influence site productivity.

A knowledge of soils helps to provide a basic understanding of the distribution and growth of tree species on the landscape. For example, yellow-poplar grows well on deep or very deep, moist soils and scarlet oak or pine is common where the rooting depth is restricted or the moisture supply is limited.

Availability of water and nutrients and landscape position largely determine which tree species grows on a particular soil. For example, yellow-poplar and beech grow on soils that have a high moisture content. Chestnut oak grows on soils that have low fertility levels and a low moisture content. Pitch pine grows on soils that have a very low moisture content.

Soil serves as a reservoir for moisture, provides an anchor for roots, and supplies most of the available nutrients. These three qualities are directly or indirectly affected by organic matter content, reaction, fertility, drainage, texture, structure, depth, and landscape position. Elevation and aspect are of particular importance in mountainous areas.

The ability of a soil to serve as a reservoir for moisture, as measured by the available water capacity, is primarily influenced by texture, organic matter content, rooting depth, and content of rock fragments. Because of the fairly even and abundant summer rainfall in the survey area, available water capacity is a limitation affecting tree growth mainly on upland soils, such as Cliffield, Cliffside, and Cleveland soils, that contain large amounts of rock fragments or have bedrock near the surface.

The susceptibility to windthrow, or the uprooting of trees by the wind, is a management concern on some soils in the survey area. These soils have a layer that limits rooting depth within 40 inches of the surface or a high water table. They include Ashe, Ashlar, Bethlehem, Chestnut, Chewacla, Cleveland, Cliffield, Cliffside, Cowee, Ostin, and Wehadkee soils.

The available supply of nutrients for tree growth is affected by several soil properties. Mineral horizons in the soil are important. Mineralization of humus releases nitrogen and other nutrients to plants. Calcium, magnesium, and potassium are held within the humus. Very small amounts of these nutrients are made available by the weathering of clay and silt particles. Most of the upland soils have been leached and contain only small amounts of nutrients below the surface layer.

The living plant community is part of the nutrient reservoir. The decomposition of leaves, stems, and other organic material recycles the nutrients that have accumulated in the forest ecosystem. Fire, excessive trampling by livestock, and erosion can result in the loss of these nutrients. Woodland management should include prevention of wildfires and protection from overgrazing.

This soil survey can be used by woodland managers planning ways to increase the productivity of forest land. Some soils respond better to applications of fertilizer than others, and some are more susceptible to landslides and erosion after roads are built and timber is harvested. Some soils require special reforestation efforts. In the section "Detailed Soil Map Units," the description of each map unit in the survey area suitable for timber includes information about productivity, limitations in harvesting timber, and management concerns in producing timber. The common forest understory plants also are listed. Table 6 summarizes this forestry information and rates the soils for a number of factors to be considered in management. *Slight, moderate,* and *severe* are used to indicate the degree of the major soil limitations to be considered in management.

Table 6 lists the *ordination symbol* for each soil. The first part of the ordination symbol, a number, indicates the potential productivity of a soil for the indicator species in cubic meters per hectare per year. The larger the number, the greater the potential productivity. Potential productivity is based on the site index and the point where mean annual increment is the greatest.

The second part of the ordination symbol, a letter, indicates the major kind of soil limitation affecting use and management. The letter *R* indicates a soil that has a significant limitation because of the slope. The letter *X* indicates that a soil has restrictions because of stones or rocks on the surface. The letter *W* indicates a soil in which excessive water, either seasonal or year-round, causes a significant limitation. The letter *T* indicates a soil that has, within the root zone, excessive alkalinity or acidity, sodium salts, or other toxic substances that limit the development of desirable trees. The letter *D* indicates a soil that has a limitation because of a restricted rooting depth, such as a shallow soil that is underlain by hard bedrock, a hardpan, or other layers that restrict roots. The letter *C* indicates a soil that has a limitation because of the kind or amount of clay in the upper part of the profile. The letter *S* indicates a dry, sandy soil. The letter *F* indicates a soil that has a high content of coarse fragments. The letter *A* indicates a soil having no significant limitations that affect forest use and management. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, and F.

Ratings of the *erosion hazard* indicate the probability that damage may occur if site preparation or harvesting activities expose the soil. The risk is *slight* if no particular preventive measures are needed under ordinary conditions; *moderate* if erosion-control measures are needed for particular silvicultural activities; and *severe* if special precautions are needed to control erosion for most silvicultural activities. Ratings of moderate or severe indicate the need for construction of higher standard roads, additional maintenance of roads, additional care in planning harvesting and reforestation activities, or the use of special equipment.

Ratings of *equipment limitation* indicate limits on the use of forest management equipment, year-round or seasonal, because of such soil characteristics as slope, wetness, stoniness, and susceptibility of the surface layer to compaction. As slope gradient and length increase, the use of wheeled equipment becomes more difficult. On the steeper slopes, tracked equipment is needed. On the steepest slopes, even tracked equipment cannot be operated and more sophisticated systems are needed. The rating is *slight* if equipment use is restricted by wetness for less than 2 months and if special equipment is not needed. The rating is *moderate* if slopes are so steep that wheeled equipment cannot be operated safely across the slope, if wetness restricts equipment use from 2 to 6 months per year, if stoniness restricts the use of ground-based equipment, or if special equipment is needed to prevent or minimize compaction. The rating is *severe* if slopes are so steep that tracked equipment cannot be operated safely across the slope, if wetness restricts equipment use for more than 6 months per year, if stoniness restricts the use of ground-based equipment, or if special equipment is needed to prevent or minimize soil compaction. Ratings of moderate or severe indicate a need to choose the best suited equipment and to carefully plan the timing of harvesting and other management activities.

Ratings of *seedling mortality* refer to the probability of the death of the naturally occurring or properly planted seedlings of good stock in periods of normal rainfall, as influenced by kinds of soil or topographic features. Seedling mortality is caused primarily by too much water or too little water. The factors used in rating a soil for seedling mortality are texture of the surface layer, depth to a high water table and the length of the period when the water table is high, rock fragments in the surface layer, rooting depth, and the aspect of the slope. The mortality rate generally is highest on soils that have a sandy or clayey surface layer. The risk is *slight* if, after site preparation, expected mortality is less than 25 percent; *moderate* if expected mortality is between 25 and 50 percent; and *severe* if expected mortality exceeds 50 percent. Ratings of moderate or severe indicate that it may be necessary to use containerized or larger than usual planting stock or to make special site preparations, such as bedding, furrowing, installing a surface drainage system, and providing artificial shade for seedlings. Reinforcement planting is often needed if the risk is moderate or severe.

Ratings of *windthrow hazard* indicate the likelihood that trees will be uprooted by the wind. A restricted rooting depth is the main reason for windthrow. The rooting depth can be restricted by a high water table, fragipan, or bedrock or by a combination of such factors as soil wetness, texture, structure, and depth. The risk is *slight* if strong winds break trees but do not uproot them; *moderate* if strong winds blow a few trees over and break many trees; and *severe* if moderate or strong winds commonly blow trees over. Ratings of moderate or severe indicate that care is needed in thinning or that the stand should not be thinned at all. Special equipment may be needed to prevent damage to shallow root systems in partial cutting operations. A plan for the periodic removal of windthrown trees and the maintenance of a road and trail system may be needed.

The *potential productivity* of *common trees* on a soil is expressed as a *site index* and a *volume* number. Common trees are listed in table 6 in the order of their

observed occurrence. Additional species that commonly occur on the soils may be listed in the detailed soil map unit descriptions. Generally, only two or three tree species dominate. The first tree listed for each soil is the indicator species for that soil. An indicator species is a tree that is common in the area and that is generally the most productive on a given soil.

For soils that are commonly used for timber production, the yield is predicted in cubic feet per acre per year. It is predicted at the point where mean annual increment culminates. The estimates of the productivity of the soils in this survey are based mainly on loblolly pine, shortleaf pine, eastern white pine, and yellow-poplar *(3, 6, 7)*. Productivity is also based on site index data from chestnut oak and Virginia pine *(5, 10, 13)*.

The *site index* is determined by taking height measurements and determining the age of selected trees within stands of a given species. This index is the average height, in feet, that the trees attain in a specified number of years (50 years in this survey). This index applies to fully stocked, even-aged, unmanaged stands. Productivity of a site can be improved through management practices, such as bedding, ditching, managing water, applying fertilizer, and planting genetically improved species.

The *volume* is the yield likely to be produced by the most important trees, expressed in cubic feet per acre per year.

Trees to plant are those that are used for reforestation or, under suitable conditions, natural regeneration. They are suited to the soils and can produce a commercial wood crop. The desired product, topographic position (such as a low, wet area), and personal preference are three factors among many that can influence the choice of trees for use in reforestation.

Recreation

Joanne Skipper, director, Polk County Recreation Department, helped prepare this section.

Polk County offers a variety of recreational activities. Recreational facilities have been developed throughout the county and include ball fields, golf courses, parks, swimming pools, and campsites. Tryon and Saluda offer many urban recreational activities and tourist sites, such as craft and antique shops, restaurants, bed-and-breakfast inns, galleries, libraries, and a movie theater. Polk County has many historic buildings and sites, some of which are open to the public.

Outdoor recreation is popular in Polk County. The county has about 15,000 acres of game lands with public access. These lands are used for hunting, fishing, hiking, photography, and scenic enjoyment. The Green River Cove has public parking and maintained access areas along the smoother sections of the river. Foot trails and old logging roads occur in scattered areas throughout the mountains. Lake Adjar has limited public access for boat launching, swimming, and fishing. Scenic vistas of the Piedmont and mountains are common throughout the county. Two of the most accessible scenic spots are White Oak Mountain and Tryon Peak. Shunkawauken Falls on White Oak Mountain is a popular spot for photographers (fig. 11). Pierson's Falls has maintained public hiking trails and picnic sites.

Equestrian events and activities are popular in Polk County. The Annual Block House Steeple Chase has achieved National recognition and draws participants and spectators from many parts of the country. Fox hunting on horseback is a traditional sport in the county and has an organized following.

Polk County has good potential for the development of additional recreational facilities. Because of the variety of topography and soils in the county, careful planning is needed to properly locate and design additional facilities and minimize costs.

The soils of the survey area are rated in table 7 according to the limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 7, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 7 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 10 and interpretations for dwellings without basements and for local roads and streets in table 9.

Figure 11.—Shunkawauken Falls on White Oak Mountain. This is one of the most accessible waterfalls in Polk County. Waterfalls are common in areas of Ashe-Cleveland-Rock outcrop complex, 50 to 95 percent slopes.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have gentle slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the period of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface (fig. 12). The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

John P. Edwards, biologist, Natural Resources Conservation Service, helped prepare this section.

Polk County has a variety of wildlife species and diverse areas of wildlife habitat. Existing land use patterns encourage and support many game species, including quail, grouse, rabbit, turkey, squirrel, dove, fox, raccoon, and white-tailed deer. Black bear are occasionally seen in the county. Because areas of cropland, idle fields, and hardwood-pine forest are interspersed, edge areas, which are important to many wildlife species, are abundant. The combination of piedmont and mountain soils also promotes habitat diversity and good populations of wildlife.

Wild turkey have been reintroduced to Polk County. They thrive in old hardwood forests, which occur in scattered areas throughout the county. Young turkeys feed on insects and therefore require canopy breaks, where grasses and other herbaceous plants can grow. Old logging roads or tree throws commonly provide openings in the canopy. Adult turkeys feed on the abundant supply of acorns produced by old hardwoods.

Small wetland areas are very important to both nongame and game species. These areas commonly occur in delineations of Wehadkee soils and as wet spots included in delineations of Arkaqua, Ostin, and Chewacla soils. The areas can be managed to maintain adequate populations of the wildlife species which inhabit them.

Wildlife populations in Polk County are currently high and should remain high as long as current land use patterns are not drastically altered. Because most of the land in Polk County is privately owned, managing and improving wildlife habitat mainly depend on private individuals. In addition to the information contained in this survey, information and assistance are available from the North Carolina Wildlife Resources Commission.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 8, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat. The ratings in table 8 are intended to be used as a guide and are not site specific. Onsite investigation is needed for individual management plans.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind

Figure 12.—A gently sloping area of Cecil sandy clay loam, 2 to 8 percent slopes, eroded, on broad piedmont ridges. This soil is well suited to golf courses.

of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally

established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are goldenrod, beggarweed, ragweed, and pokeberry.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, yellow-poplar, black cherry, sweetgum, apple, hawthorn, dogwood, and hickory. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are blackberry, blueberry, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, hemlock, and cedar.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, slope, and surface stoniness. Examples of wetland plants are smartweed, ferns, arrow-arum, wetland grasses, cattail, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are waterfowl feeding areas and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, meadowlark, field sparrow, cottontail rabbit, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, white-tailed deer, and black bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills,

septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 9 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock or a very firm dense layer, stone content, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. Depth to a high water table, depth to bedrock (fig. 13), large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock, depth to a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost-action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, depth to a high water table, depth to bedrock, and the available water capacity in the upper 40 inches affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established. Soil tests are essential to determine liming and fertilizer needs. Help in making soil tests or in deciding what soil additive, if any, should be used can be obtained from the office of the Polk Soil and Water Conservation District or the North Carolina Cooperative Extension Service.

Sanitary Facilities

Table 10 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 10 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and that good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates

Figure 13.—A site for a dwelling with a basement on Bethlehem soil in an area of Pacolet-Bethlehem complex, 8 to 15 percent slopes, eroded. Soft, weathered bedrock is near the surface. It increases excavation costs and construction time.

that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, depth to a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock interfere with installation.

Unsatisfactory performance of septic tank absorption

fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. The animal waste lagoons commonly used in farming operations are not considered in the ratings. They are generally deeper than the lagoons referred to in the table and rely on anaerobic bacteria to decompose waste materials.

Table 10 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, depth to a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope or bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 11 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel, or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* have more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 11, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale, siltstone, and weathered granite saprolite, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are naturally fertile or respond well to fertilizer and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel or stones, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel or stones, have slopes of more than 15 percent, or have a high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and releases a variety of plant nutrients as it decomposes.

Water Management

Table 12 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives the restrictive features that affect each soil for drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area. Ponds that are less than about 2 acres in size are not shown on the maps because of the scale of mapping.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of

material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, and mica. Depth to a high water table affects the amount of usable material. It also affects trafficability.

Soils that have a high content of mica, such as Fannin, Grover, and Madison soils, are poorly suited to use in the construction of embankments. The problems resulting from the high content of mica include difficulty in compaction, poor trafficability, susceptibility to erosion, and low shear strength. Also, piping commonly is a problem if the soil material is used to impound water.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement, permeability, depth to a high water table or depth of standing water if the soil is subject to ponding, slope, susceptibility to flooding, and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity. Availability of drainage outlets is not considered in the ratings.

Drainage may be a major management consideration in some areas. Management of drainage in conformance with regulations concerning wetlands may require special permits and extra planning. The local office of the Natural Resources Conservation Service should be contacted for identification of hydric soils and potential wetlands.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock. The performance of a system is affected by the availability of suitable irrigation water, the depth of the root zone, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A hazard of soil blowing, a low available water capacity, restricted rooting depth, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed *(20)*. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 16.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 13 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages, by weight, of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, by volume, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20, or higher, for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 16.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074

millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

Physical and Chemical Properties

Table 14 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence the shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of movement of water through the soil when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage in each major soil layer is stated in inches of water per inch of soil. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time. It is the difference between the amount of soil water at field moisture capacity and the amount at wilting point.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, more than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion. Losses are expressed in tons per acre per year. These estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur over a sustained period without affecting crop productivity. The rate is expressed in tons per acre per year.

Wind erodibility groups are made up of soils that have

similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. The soils assigned to group 1 are the most susceptible to soil blowing, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.
8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 14, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 15 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep or very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep to very deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflowing streams, by runoff from adjacent slopes, or by inflow from high tides. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in swamps and marshes or in a closed depression is considered ponding.

Table 15 gives the frequency and duration of flooding and the time of year when flooding is most likely to occur.

Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as *none, rare, occasional,* or *frequent. None* means that flooding is not probable. *Rare* means that flooding is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year). *Occasional* means that flooding occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year). *Frequent* means that flooding occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 days to 1 month), and *very long* (more than 1 month). The time of year that floods are most likely to occur is expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a

saturated zone in the soil in most years. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. Indicated in table 15 are the depth to the high water table; the kind of water table—that is, *perched* or *apparent;* and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 15.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and the amount of sulfates in the saturation extract.

Engineering Index Test Data

Table 16 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology." The soil samples were tested by the Soil Mechanics Laboratory, Fort Worth, Texas, and by the North Carolina Department of Transportation and Highway Safety, Materials and Test Unit, Raleigh, North Carolina.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are Unified classification—D 2487 (ASTM); AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Mechanical analysis—T 88 (AASHTO), D 422 (ASTM), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 4318 (ASTM); Plasticity index—T 90 (AASHTO), D 4318 (ASTM); Moisture density—T 99 (AASHTO), D 698 (ASTM); and Specific gravity—T 100 (AASHTO), D 854 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(19)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or on laboratory measurements. Table 17 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Ultisol.

SUBORDER. Each order is divided into suborders, primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udult (*Ud*, meaning humid climate, plus *ult*, from Ultisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludults (*Hapl*, meaning minimal horizon development, plus *udult*, the suborder of the Ultisols that occurs in humid climates).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludults.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, micaceous, thermic Typic Hapludults.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. There can be some variation in the texture of the surface layer or of the underlying material within a series. The Grover series is an example of fine-loamy, micaceous, thermic Typic Hapludults.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The location of the typical pedon is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" *(22)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(19)* and in "Keys to Soil Taxonomy" *(21)*. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Appling Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape position: Piedmont uplands
Parent material: Residuum that weathered mainly from high-grade metamorphic rock, such as biotite gneiss

Slope range: 2 to 6 percent
Commonly associated soils: Cecil and Pacolet soils on uplands; Dogue and Roanoke soils on adjacent stream terraces
Taxonomic class: Clayey, kaolinitic, thermic Typic Kanhapludults

Typical Pedon

Appling sandy loam, 2 to 6 percent slopes; about 1.3 miles southeast of Sandy Plains on North Carolina Highway 9, about 0.9 mile southwest on Secondary Road 1521, about 300 feet east of the road, in cropland:

Ap—0 to 8 inches; brown (10YR 5/3) sandy loam; weak fine granular structure; very friable; common fine and medium roots; few fine flakes of mica; slightly acid; clear smooth boundary.
Bt1—8 to 17 inches; yellowish brown (10YR 5/6) clay; moderate medium subangular blocky structure; firm; sticky, plastic; few distinct clay films on faces of peds; common fine and medium roots; few fine flakes of mica; moderately acid; gradual wavy boundary.
Bt2—17 to 33 inches; reddish yellow (7.5YR 6/6) clay; few medium prominent red (2.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; sticky, plastic; few distinct clay films on faces of peds; few fine roots; few fine flakes of mica; strongly acid; gradual wavy boundary.
Bt3—33 to 55 inches; yellowish red (5YR 5/8) clay; common medium distinct red (2.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; sticky, plastic; few faint clay films on faces of peds; few fine flakes of mica; very strongly acid; gradual wavy boundary.
BC—55 to 65 inches; yellowish red (5YR 5/8) and strong brown (7.5YR 5/8) clay loam; common coarse distinct red (2.5YR 5/8) mottles; few pockets of saprolite consisting of sandy clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few fine flakes of mica; very strongly acid.

Range in Characteristics

Thickness of solum: 40 to more than 60 inches
Depth to bedrock: Greater than 60 inches
Reaction: Strongly acid or very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Content and size of rock fragments: 0 to 15 percent, by volume, in the A horizon and 0 to 10 percent in the lower horizons; dominantly gravel

Ap horizon:
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—sandy loam

BA horizon (if it occurs):
Hue—5YR to 10YR
Value—5 or 6
Chroma—3 to 8
Texture—sandy clay loam

Bt horizon:
Hue—5YR to 2.5Y
Value—4 to 6
Chroma—4 to 8
Mottles—none to many in shades of red, yellow, or brown
Texture—clay, sandy clay, or clay loam

BC horizon:
Color—similar to those of the Bt horizon or mottled
Mottles—common or many in shades of red, yellow, or brown
Texture—clay loam, sandy clay, or sandy clay loam

C horizon (if it occurs):
Color—similar to the BC horizon or multicolored
Texture—loamy saprolite

Arkaqua Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Landscape position: Mountain flood plains
Parent material: Recent alluvium derived from mixed geologic sources
Slope range: 0 to 2 percent
Commonly associated soils: Dillard and Brevard soils on adjacent stream terraces and hill slopes; Evard, Fannin, Cowee, and Hayesville soils on adjacent uplands
Taxonomic class: Fine-loamy, mixed, mesic Fluvaquentic Dystrochrepts

Typical Pedon

Arkaqua loam, 0 to 2 percent slopes, occasionally flooded; about 0.4 mile east of Saluda on U.S. Highway 176, about 0.1 mile north on Secondary Road 1181, about 1.0 mile northeast on Secondary Road 1142, about 0.2 mile east on Secondary Road 1122, about 20 feet west of the road, in woodland:

A—0 to 10 inches; dark yellowish brown (10YR 4/4) loam; weak medium granular structure; very friable; many fine and medium and common coarse roots; few fine flakes of mica; slightly acid; clear smooth boundary.
Bw1—10 to 20 inches; dark yellowish brown (10YR 4/6)

loam; moderate medium subangular blocky structure; friable; common fine and medium roots; few fine distinct reddish brown (5YR 4/4) iron accumulations; common fine and medium flakes of mica; slightly acid; clear wavy boundary.

Bw2—20 to 31 inches; yellowish brown (10YR 5/6) sandy clay loam; moderate medium subangular blocky structure; friable; slightly sticky, slightly plastic; few fine and medium roots; common medium distinct reddish brown (5YR 4/4) iron accumulations; common medium distinct light brownish gray (2.5Y 6/2) iron depletions; common fine and medium flakes of mica; slightly acid; gradual smooth boundary.

Bg—31 to 38 inches; gray (10YR 5/1) sandy clay loam; weak fine subangular blocky structure; friable; slightly sticky, slightly plastic; few fine prominent brownish yellow (10YR 6/8) iron accumulations; many fine and medium flakes of mica; moderately acid; clear wavy boundary.

Cg1—38 to 48 inches; gray (N 5/0) sandy loam stratified with lenses of sandy clay loam; massive; very friable; slightly sticky, slightly plastic; many fine and medium flakes of mica; strongly acid; clear smooth boundary.

Cg2—48 to 51 inches; very dark grayish brown (10YR 3/2) loam stratified with lenses of sandy loam; massive; very friable; slightly sticky, slightly plastic; few fine and medium old roots; few fine and medium flakes of mica; moderately acid; abrupt wavy boundary.

C—51 to 60 inches; pale brown (10YR 6/3) and yellowish brown (10YR 5/8) gravelly loamy sand; single grained; loose; nonsticky, nonplastic; 25 percent gravel, by volume; few medium and coarse flakes of mica; moderately acid.

Range in Characteristics

Thickness of solum: 37 to 60 inches
Depth to bedrock: Greater than 60 inches
Reaction: Moderately acid to very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Content and size of rock fragments: 0 to 5 percent, by volume, in horizons above a depth of 46 inches and 0 to 65 percent in the C horizon below a depth of 46 inches; dominantly gravel

A horizon:
Hue—7.5YR to 10YR
Value—3 or 4
Chroma—2 to 4
Texture—loam

Bw1 horizon:
Hue—10YR to 5Y
Value—3 to 8
Chroma—3 to 8
Redoximorphic features—few or common iron accumulations in shades of red or brown
Texture—loam, sandy loam, fine sandy loam, silt loam, sandy clay loam, or clay loam

Bw2 horizon:
Hue—10YR to 5Y
Value—3 to 5
Chroma—3 to 8
Redoximorphic features—few or common iron depletions in shades of gray within a depth of 24 inches and iron accumulations in shades of brown or red
Texture—sandy clay loam, fine sandy loam, loam, silt loam, or clay loam

Bg horizon:
Hue—10YR to 5Y
Value—3 to 5
Chroma—1 or 2
Redoximorphic features—few to many iron accumulations in shades of brown or red and iron depletions in shades of gray
Texture—dominantly sandy clay loam, fine sandy loam, loam, silt loam, or clay loam; sandy loam in a few areas

Cg or C horizon:
Hue—horizon is neutral in hue or has hue of 7.5YR to 5Y
Value—2 to 6
Chroma—0 to 6
Texture—sandy loam, loam, sandy clay loam, clay loam, or fine sandy loam; variable at depths below 46 inches; ranging from sand to loam in the fine-earth fraction

Ashe Series

Depth class: Moderately deep
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Landscape position: Mountain uplands
Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rocks, such as biotite gneiss, migmatitic gneiss, and porphyroblastic gneiss
Slope range: 50 to 95 percent
Commonly associated soils: Evard, Fannin, Cowee, Cliffield, and Cleveland soils on uplands; Tate and Greenlee soils in adjacent coves and on hill slopes

Taxonomic class: Coarse-loamy, mixed, mesic Typic Dystrochrepts

Typical Pedon

Ashe sandy loam in an area of Ashe-Cleveland-Rock outcrop complex, 50 to 95 percent slopes; about 1.7 miles northwest of Columbus on Secondary Road 1135, about 3.0 miles north on Secondary Road 1136, about 1.2 miles southwest on the North Carolina Forest Service access road leading to Tryon Peak fire tower, 100 feet southeast of the fire tower, in woodland:

A—0 to 4 inches; very dark grayish brown (10YR 3/2) sandy loam; weak fine granular structure; very friable; many fine, medium, and coarse roots; 10 percent stones and 5 percent gravel, by volume; few fine flakes of mica; strongly acid; clear wavy boundary.

Bw—4 to 14 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine subangular blocky structure; very friable; common fine, medium, and coarse roots; 10 percent stones and 5 percent gravel, by volume; few fine and medium flakes of mica; strongly acid; gradual wavy boundary.

C—14 to 32 inches; saprolite consisting of yellowish brown (10YR 5/4) sandy loam; massive; very friable; common fine and medium and few coarse roots; common fine and medium flakes of mica; 5 percent gravel, by volume; common fine flakes of mica; very strongly acid; abrupt smooth boundary.

R—32 inches; hard migmatitic gneiss bedrock.

Range in Characteristics

Thickness of solum: 14 to 40 inches
Depth to bedrock: 20 to 40 inches to hard bedrock
Reaction: Moderately acid to very strongly acid
Content and size of rock fragments: 5 to 15 percent, by volume, in the A horizon and 5 to 35 percent in the lower horizons; ranging dominantly from gravel to stones

A horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—2 to 6
Texture—sandy loam

Bw horizon:
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—4 to 8
Texture—loam, fine sandy loam, sandy loam, or coarse sandy loam in the fine-earth fraction

C horizon:
Color—similar to the Bw horizon or multicolored
Texture—saprolite consisting of variable textures; ranging from sandy loam to loamy coarse sand in the fine-earth fraction

Cr horizon (if it occurs):
Texture—soft, weathered gneiss bedrock that can be dug with difficulty using hand tools

R horizon:
Texture—hard gneiss bedrock that cannot be dug using hand tools

Ashlar Series

Depth class: Moderately deep
Drainage class: Excessively drained
Permeability: Moderately rapid
Landscape position: Piedmont uplands
Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rocks, such as biotite gneiss and migmatitic gneiss
Slope range: 45 to 70 percent
Commonly associated soils: Rion, Grover, Pacolet, Madison, Bethlehem, and Cliffside soils on uplands
Taxonomic class: Coarse-loamy, mixed, thermic Typic Dystrochrepts

Typical Pedon

Ashlar gravelly sandy loam in an area of Rion-Ashlar-Rock outcrop complex, 45 to 70 percent slopes; about 0.5 mile north of Mill Spring on Secondary Road 1326, about 3.2 miles northwest on Secondary Road 1313, about 2,000 feet east on a logging road adjacent to the north side of the Green River, 300 feet northwest, in woodland:

A—0 to 5 inches; yellowish brown (10YR 5/4) gravelly sandy loam; weak fine granular structure; very friable; many fine and medium and common coarse roots; 15 percent gravel, by volume; few fine and medium flakes of mica; very strongly acid; clear smooth boundary.

Bw—5 to 24 inches; strong brown (7.5YR 5/6) sandy loam; weak medium subangular blocky structure; very friable; common fine and medium and few coarse roots; 10 percent gravel, by volume; common fine and medium flakes of mica; very strongly acid; abrupt smooth boundary.

R—24 inches; hard biotite gneiss bedrock.

Range in Characteristics

Thickness of solum: 15 to 38 inches
Depth to bedrock: 20 to 40 inches to hard bedrock
Reaction: Strongly acid or very strongly acid

Content and size of rock fragments: 15 to 30 percent, by volume, in the A horizon and 0 to 30 percent in the lower horizons; dominantly gravel

A horizon:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—2 to 4
Texture—gravelly sandy loam

Bw horizon:
Hue—5YR to 10YR
Value—4 to 6
Chroma—4 to 8
Texture—sandy loam or fine sandy loam in the fine-earth fraction

C horizon (if it occurs):
Color—similar to the Bw horizon or multicolored
Texture—saprolite; loamy in the fine-earth fraction

Cr horizon (if it occurs):
Texture—soft, weathered gneiss bedrock that can be dug with difficulty using hand tools

R horizon:
Texture—hard gneiss bedrock that cannot be dug using hand tools

Bethlehem Series

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Landscape position: Piedmont uplands
Parent material: Residuum that weathered mainly from high-grade metamorphic rock, such as sillimanite-mica schist
Slope range: 8 to 25 percent
Commonly associated soils: Pacolet, Madison, Rion, and Cliffside soils on uplands
Taxonomic class: Clayey, kaolinitic, thermic Typic Kanhapludults

Typical Pedon

Bethlehem gravelly coarse sandy loam in an area of Pacolet-Bethlehem complex, 8 to 15 percent slopes, eroded; about 0.7 mile northwest of Sandy Plains on North Carolina Highway 9, about 0.8 mile west on Secondary Road 1526, about 200 feet north of the road, in woodland:

Ap—0 to 4 inches; strong brown (7.5YR 4/6) gravelly coarse sandy loam; weak medium granular structure; friable; many fine and medium and few coarse roots; 29 percent gravel, by volume; few fine flakes of mica; very strongly acid; clear smooth boundary.

Bt1—4 to 8 inches; yellowish red (5YR 4/6) clay loam; weak medium subangular blocky structure; friable; sticky, plastic; common faint clay films on faces of peds; many fine and medium and few coarse roots; 10 percent gravel, by volume; few fine and medium flakes of mica; very strongly acid; gradual wavy boundary.

Bt2—8 to 18 inches; red (2.5YR 4/8) clay; moderate medium subangular blocky structure; firm; sticky, plastic; common distinct clay films on faces of peds; common fine and medium and few coarse roots; few fine and medium flakes of mica; strongly acid; gradual wavy boundary.

Bt3—18 to 23 inches; red (2.5YR 4/8) gravelly clay; moderate medium subangular blocky structure; firm; sticky, plastic; few distinct clay films on faces of peds; few fine and medium roots; 15 percent gravel, by volume; common fine and medium flakes of mica; strongly acid; abrupt wavy boundary.

Cr—23 to 60 inches; soft, weathered sillimanite-mica schist bedrock.

Range in Characteristics

Thickness of solum: 20 to 40 inches
Depth to bedrock: 20 to 40 inches to soft, weathered bedrock (fig. 14)
Reaction: Strongly acid or very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Content and size of rock fragments: 15 to 35 percent, by volume, in the A horizon and 0 to 35 percent in the lower horizons; dominantly gravel or cobbles

Ap horizon:
Hue—5YR to 7.5YR
Value—3 to 5
Chroma—4 or 6
Texture—gravelly coarse sandy loam

Bt horizon:
Hue—2.5YR or 5YR
Value—4 or 5
Chroma—6 or 8
Texture—clay loam or clay in the fine-earth fraction

BC horizon (if it occurs):
Hue—2.5YR or 5YR
Value—4 or 5
Chroma—6 or 8
Texture—clay loam or sandy clay loam in the fine-earth fraction

C horizon (if it occurs):
Color—multicolored
Texture—saprolite; loamy in the fine-earth fraction

Cr horizon:
Texture—soft, weathered sillimanite-mica schist bedrock that can be dug with difficulty using hand tools

Brevard Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape position: Mountain coves and hill slopes
Parent material: Colluvium derived from mixed geologic sources
Slope range: 8 to 15 percent
Commonly associated soils: Evard, Cowee, Fannin, and Hayesville soils on adjacent uplands; Arkaqua soils on adjacent flood plains; Dillard soils on adjacent stream terraces
Taxonomic class: Fine-loamy, oxidic, mesic Typic Hapludults

Typical Pedon

Brevard sandy loam, 8 to 15 percent slopes; about 0.4 mile west of Saluda on U.S. Highway 176, about 0.1 mile north on Secondary Road 1181, about 0.1 mile northwest on a development road, 200 feet west of the road, in cropland:

Ap—0 to 6 inches; dark brown (7.5YR 4/4) sandy loam; weak medium granular structure; friable; many fine and medium roots; few fine flakes of mica; moderately acid; clear smooth boundary.
Bt1—6 to 20 inches; yellowish red (5YR 5/6) sandy clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few distinct clay films on faces of peds; common fine and medium roots; few fine flakes of mica; moderately acid; gradual wavy boundary.
Bt2—20 to 29 inches; yellowish red (5YR 5/6) clay loam; moderate medium subangular blocky structure; friable; slightly sticky, slightly plastic; few faint clay films on faces of peds; few fine roots; few fine flakes of mica; moderately acid; gradual wavy boundary.
Bt3—29 to 38 inches; yellowish red (5YR 5/8) clay loam; few medium distinct red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; friable; slightly sticky, slightly plastic; few faint clay films on faces of peds; few fine flakes of mica; strongly acid; gradual wavy boundary.
Bt4—38 to 65 inches; red (2.5YR 4/8) clay loam; common coarse distinct strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few faint clay films on faces of peds; few fine flakes of mica; strongly acid.

Range in Characteristics

Thickness of solum: 43 to more than 60 inches
Depth to bedrock: Greater than 60 inches
Reaction: Moderately acid to very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Content and size of rock fragments: 0 to 15 percent, by volume, throughout the profile; dominantly gravel

Ap horizon:
Hue—7.5YR to 10YR
Value—3 to 5
Chroma—3 or 4
Texture—sandy loam

Bt horizon:
Hue—2.5YR or 5YR
Value—4 to 6
Chroma—4 to 8
Texture—sandy clay loam, clay loam, silty clay loam, or loam

BC horizon (if it occurs):
Hue—2.5YR to 7.5YR
Value—4 to 6
Chroma—4 to 8
Mottles (if they occur)—few or common in shades of yellow or brown
Texture—fine sandy loam, sandy clay loam, sandy loam, or loam

C horizon (if it occurs):
Color—variable
Texture—loamy or clayey

Buncombe Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid
Landscape position: Piedmont flood plains
Parent material: Recent alluvium derived from mixed geologic sources
Slope range: 0 to 5 percent
Commonly associated soils: Chewacla, Riverview, and Wehadkee soils on flood plains; Skyuka, Masada, Dogue, and Roanoke soils on adjacent stream terraces
Taxonomic class: Mixed, thermic Typic Udipsamments

Typical Pedon

Buncombe loamy sand, 0 to 5 percent slopes, occasionally flooded; about 1.0 mile north of McGinnis Crossroads on Secondary Road 1004, about 1.5 miles northeast on Secondary Road 1359, about 0.2 mile east

on Secondary Road 1004, about 1.5 miles north on Secondary Road 1356, about 500 feet northeast from the end of the road, in cropland:

Ap—0 to 15 inches; dark yellowish brown (10YR 4/6) loamy sand; weak fine granular structure; very friable; common fine and medium roots; common fine flakes of mica; moderately acid; clear smooth boundary.
C1—15 to 38 inches; yellowish brown (10YR 5/4) sand; single grained; loose; few fine roots; common fine flakes of mica; moderately acid; gradual smooth boundary.
C2—38 to 42 inches; light yellowish brown (10YR 6/4) sand; single grained; loose; common fine flakes of mica; slightly acid; gradual smooth boundary.
C3—42 to 48 inches; brown (10YR 5/3) sand; single grained; loose; common fine flakes of mica; slightly acid; clear smooth boundary.
C4—48 to 65 inches; pale brown (10YR 6/3) sand; single grained; loose; common fine flakes of mica; slightly acid.

Range in Characteristics

Depth to bedrock: Greater than 60 inches
Reaction: Slightly acid to very strongly acid
Content and size of rock fragments: 0 to 5 percent, by volume, throughout the profile; dominantly gravel

Ap horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—2 to 6
Texture—loamy sand

C horizon:
Hue—5YR to 2.5Y
Value—3 to 8
Chroma—3 to 8
Redoximorphic features (if they occur)—few in shades of gray below a depth of 40 inches; occurring randomly
Texture—sand, loamy sand, or loamy fine sand; stratified loamy and sandy textures may occur below a depth of 40 inches

Cecil Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape position: Piedmont uplands
Parent material: Residuum that weathered mainly from high-grade metamorphic rock, such as biotite gneiss
Slope range: 2 to 8 percent
Commonly associated soils: Appling, Pacolet, and Madison soils on uplands
Taxonomic class: Clayey, kaolinitic, thermic Typic Kanhapludults

Typical Pedon

Cecil sandy clay loam, 2 to 8 percent slopes, eroded; about 1.3 miles southeast of Sandy Plains on North Carolina Highway 9, about 0.5 mile southwest on Secondary Road 1521, about 1,000 feet west of the road, in cropland:

Ap—0 to 6 inches; strong brown (7.5YR 4/6) sandy clay loam; moderate medium granular structure; friable; many fine and medium roots; 10 percent gravel, by volume; few fine flakes of mica; slightly acid; clear smooth boundary.
Bt1—6 to 25 inches; red (2.5YR 4/6) clay; moderate medium subangular blocky structure; firm; sticky, plastic; common distinct clay films on faces of peds; few fine and medium roots; few fine flakes of mica; slightly acid; gradual wavy boundary.
Bt2—25 to 42 inches; red (2.5YR 4/8) clay; moderate medium subangular blocky structure; firm; sticky, plastic; few distinct clay films on faces of peds; few fine flakes of mica; strongly acid; gradual wavy boundary.
Bt3—42 to 58 inches; red (2.5YR 5/8) clay; few medium distinct yellowish red (5YR 5/8) mottles; moderate medium subangular blocky structure; firm; sticky, plastic; few faint clay films on faces of peds; few fine flakes of mica; very strongly acid; gradual wavy boundary.
BC—58 to 65 inches; yellowish red (5YR 5/8) clay loam; few medium distinct strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; common fine flakes of mica; very strongly acid.

Range in Characteristics

Thickness of solum: 46 to more than 60 inches
Depth to bedrock: Greater than 60 inches
Reaction: Strongly acid or very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Content and size of rock fragments: 0 to 15 percent, by volume, in the A horizon and 0 to 10 percent in the lower horizons; dominantly gravel

Ap horizon:
Hue—2.5YR to 7.5YR
Value—4 or 5
Chroma—4 to 8
Texture—sandy clay loam

Bt horizon:
Hue—10R or 2.5YR
Value—4 or 5
Chroma—6 or 8
Mottles (if they occur)—few in shades of yellow or brown; occurring randomly
Texture—clay or clay loam

BC horizon:
Hue—10R to 5YR
Value—4 to 6
Chroma—4 to 8
Mottles (if they occur)—few in shades of yellow or brown; occurring randomly
Texture—clay loam or sandy clay loam

C horizon (if it occurs):
Color—similar to the BC horizon or multicolored
Texture—loamy saprolite

Chestnut Series

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately rapid
Landscape position: Mountain uplands
Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rocks, such as biotite gneiss, migmatitic gneiss, and porphyroblastic gneiss
Slope range: 50 to 95 percent
Commonly associated soils: Edneyville, Evard, Cowee, Cliffield, Ashe, and Cleveland soils on uplands; Tate and Greenlee soils in adjacent coves and on hill slopes
Taxonomic class: Coarse-loamy, mixed, mesic Typic Dystrochrepts

Typical Pedon

Chestnut sandy loam in an area of Edneyville-Chestnut complex, 50 to 95 percent slopes, stony; about 0.7 mile west on Secondary Road 1154 from the Henderson-Polk County line, 1.1 miles southwest on an old logging road on the southeast side of Pulliam Creek, 10 feet southeast of the road, in woodland:

A—0 to 3 inches; dark brown (10YR 4/3) sandy loam; weak fine granular structure; very friable; many fine, medium, and coarse roots; 5 percent gravel and 5 percent cobbles, by volume; few fine flakes of mica; very strongly acid; clear smooth boundary.
Bw—3 to 20 inches; yellowish brown (10YR 5/4) sandy loam; weak fine subangular blocky structure; very friable; common fine, medium, and coarse roots; 5 percent gravel, by volume; few fine and medium flakes of mica; strongly acid; gradual wavy boundary.
C—20 to 25 inches; saprolite consisting of light yellowish brown (10YR 6/4) sandy loam; massive; very friable; common fine and medium and few coarse roots; 5 percent gravel, by volume; few fine and medium flakes of mica; strongly acid; abrupt wavy boundary.
Cr—25 to 48 inches; soft, weathered porphyroblastic gneiss bedrock.
R—48 inches; hard porphyroblastic gneiss bedrock.

Range in Characteristics

Thickness of solum: 15 to 39 inches
Depth to bedrock: 20 to 40 inches to soft, weathered bedrock; typically 40 to 60 inches to hard bedrock
Reaction: Moderately acid to very strongly acid
Content and size of rock fragments: 5 to 15 percent, by volume, in the A horizon and 5 to 35 percent in the lower horizons; dominantly gravel or cobbles

A horizon:
Hue—7.5YR to 2.5Y
Value—2 to 6
Chroma—2 to 6
Texture—sandy loam

Bw horizon:
Hue—5YR to 2.5Y
Value—4 to 6
Chroma—3 to 8
Texture—sandy loam, loam, or fine sandy loam in the fine-earth fraction

C horizon:
Color—similar to the Bw horizon or multicolored
Texture—saprolite consisting of variable textures; ranging from loam to loamy sand in the fine-earth fraction

Cr horizon (if it occurs):
Texture—soft, weathered gneiss bedrock that can be dug with difficulty using hand tools

R horizon:
Texture—hard gneiss bedrock that cannot be dug using hand tools

Chewacla Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Landscape position: Piedmont flood plains
Parent material: Recent alluvium derived from mixed geologic sources

Slope range: 0 to 2 percent
Commonly associated soils: Riverview, Buncombe, and Wehadkee soils on flood plains; Skyuka, Masada, Dogue, and Roanoke soils on adjacent stream terraces
Taxonomic class: Fine-loamy, mixed, thermic Fluvaquentic Dystrochrepts

Typical Pedon

Chewacla loam, 0 to 2 percent slopes, occasionally flooded; about 0.7 mile southeast of Sandy Plains on North Carolina Highway 9, about 0.6 mile southwest on a development access road, 60 feet east of the road and 20 feet northeast of a creek, in woodland:

A—0 to 7 inches; dark brown (7.5YR 4/4) loam; weak medium granular structure; very friable; many fine and medium and few coarse roots; few fine flakes of mica; moderately acid; clear smooth boundary.
Bw1—7 to 16 inches; brown (10YR 5/3) loam; weak medium subangular blocky structure; friable; common fine and medium roots; few medium distinct light brown (7.5YR 6/4) iron accumulations; few fine flakes of mica; moderately acid; clear smooth boundary.
Bw2—16 to 21 inches; dark brown (10YR 4/3) loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few fine and medium roots; common medium distinct dark gray (10YR 4/1) iron depletions; few fine flakes of mica; moderately acid; clear smooth boundary.
Cg1—21 to 48 inches; gray (5Y 5/1) silty clay loam; massive; firm; slightly sticky, slightly plastic; few fine prominent yellowish brown (10YR 5/6) iron accumulations; few fine flakes of mica; strongly acid; clear smooth boundary.
Cg2—48 to 65 inches; gray (N 5/0) silty clay loam; massive; firm; slightly sticky, slightly plastic; few fine prominent dark reddish brown (5YR 3/2) iron accumulations; moderately acid.

Range in Characteristics

Thickness of solum: 15 to 70 inches
Depth to bedrock: Greater than 60 inches
Reaction: Slightly acid to very strongly acid within a depth of 40 inches; slightly alkaline to very strongly acid below a depth of 40 inches
Content and size of rock fragments: 0 to 5 percent, by volume, in the A and B horizons, 0 to 15 percent in the C horizon above a depth of 40 inches, and 0 to 65 percent in horizons below a depth of 40 inches; dominantly gravel

A horizon:
Hue—5YR to 10YR
Value—4 or 5
Chroma—1 to 4
Texture—loam

Bw horizon:
Hue—5YR to 2.5Y
Value—4 to 7
Chroma—3 to 8
Redoximorphic features—few or common iron depletions in shades of gray within a depth of 24 inches and iron accumulations in shades of brown
Texture—loam, sandy clay loam, sandy loam, fine sandy loam, clay loam, silt loam, or silty clay loam

Bg horizon (if it occurs):
Hue—horizon is neutral in hue or has hue of 10YR or 2.5Y
Value—4 to 7
Chroma—0 or 2
Texture—loam, sandy clay loam, sandy loam, fine sandy loam, clay loam, silt loam, or silty clay loam

BC or BCg horizon (if it occurs):
Hue—horizon is neutral in hue or has hue of 10YR or 2.5Y
Value—4 to 7
Chroma—0 or 2
Texture—loam, sandy clay loam, sandy loam, fine sandy loam, clay loam, silt loam, or silty clay loam

C or Cg horizon:
Color—similar to the Bw and Bg horizons
Texture—loamy to a depth of 40 inches; variable below a depth of 40 inches; ranging from sand to clay in the fine-earth fraction

Cleveland Series

Depth class: Shallow
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Landscape position: Mountain uplands
Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rocks, such as biotite gneiss, migmatitic gneiss, and porphyroblastic gneiss
Slope range: 50 to 95 percent
Commonly associated soils: Evard, Fannin, Cowee, Cliffield, and Ashe soils on uplands; Tate and Greenlee soils in adjacent coves and on hill slopes
Taxonomic class: Loamy, mixed, mesic Lithic Dystrochrepts

Typical Pedon

Cleveland sandy loam in an area of Ashe-Cleveland-Rock outcrop complex, 50 to 95 percent slopes; about 1.7 miles

northwest of Columbus on Secondary Road 1135, about 3.0 miles north on Secondary Road 1136, about 1.2 miles southwest on the North Carolina Forest Service access road leading to Tryon Peak fire tower, 120 feet southeast of the fire tower, in woodland:

A—0 to 4 inches; dark brown (10YR 3/3) sandy loam; weak fine granular structure; very friable; many fine, medium, and coarse roots; 10 percent gravel, by volume; few fine flakes of mica; very strongly acid; gradual wavy boundary.

Bw—4 to 13 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine subangular blocky structure; very friable; many fine and medium and common coarse roots; 10 percent gravel, by volume; few fine flakes of mica; strongly acid; abrupt smooth boundary.

R—13 inches; hard migmatitic gneiss bedrock.

Range in Characteristics

Thickness of solum: 10 to 20 inches

Depth to bedrock: 10 to 20 inches to hard bedrock (fig. 15)

Reaction: Moderately acid to very strongly acid

Content and size of rock fragments: 5 to 15 percent, by volume, in the A horizon and 5 to 35 percent in the lower horizons; ranging dominantly from gravel to stones

A horizon:
- Hue—7.5YR or 10YR
- Value—2 to 5
- Chroma—1 to 4
- Texture—sandy loam

Bw horizon:
- Hue—7.5YR or 10YR
- Value—4 or 6
- Chroma—3 to 8
- Texture—sandy loam, loam, or fine sandy loam in the fine-earth fraction

C horizon (if it occurs):
- Color—similar to the Bw horizon or multicolored
- Texture—saprolite; loamy in the fine-earth fraction

R horizon:
- Texture—hard gneiss bedrock that cannot be dug using hand tools

Cliffield Series

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Landscape position: Mountain uplands

Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rock, such as sillimanite-mica schist

Slope range: 15 to 30 percent

Commonly associated soils: Evard, Cowee, Ashe, and Cleveland soils on uplands

Taxonomic class: Loamy-skeletal, mixed, mesic Typic Hapludults

Typical Pedon

Cliffield cobbly loam in an area of Cliffield-Cowee complex, 15 to 30 percent slopes, very stony; about 2.6 miles west of Tryon on Secondary Road 1116, about 0.4 mile north on a subdivision access road, 150 feet north of the road, in woodland:

A1—0 to 2 inches; dark brown (10YR 3/3) cobbly loam; weak fine granular structure; very friable; many fine, medium, and coarse roots; 15 percent gravel and 10 percent cobbles, by volume; fragments are randomly oriented; common fine and medium flakes of mica; very strongly acid; clear smooth boundary.

A2—2 to 4 inches; dark yellowish brown (10YR 4/6) cobbly loam; weak medium granular structure; very friable; many fine, medium, and coarse roots; 15 percent gravel and 10 percent cobbles, by volume; fragments are randomly oriented; common fine and medium flakes of mica; very strongly acid; clear smooth boundary.

Bt1—4 to 16 inches; yellowish brown (10YR 5/6) very cobbly clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; common fine, medium, and coarse roots; 20 percent gravel, 20 percent cobbles, and 10 percent stones, by volume; fragments are randomly oriented; common fine and medium flakes of mica; very strongly acid; clear smooth boundary.

Bt2—16 to 33 inches; strong brown (7.5YR 5/8) very cobbly loam; weak medium subangular blocky structure; friable; common fine, medium, and coarse roots; 30 percent stones, 20 percent gravel, and 20 percent cobbles, by volume; fragments are horizontally oriented; common fine and medium flakes of mica; very strongly acid; clear irregular boundary.

R—33 inches; hard, fractured sillimanite-mica schist bedrock; few thin, soft weathered bedrock interlayers.

Range in Characteristics

Thickness of solum: 20 to 40 inches

Depth to bedrock: 20 to 40 inches to hard bedrock (fig. 16)

Reaction: Strongly acid to extremely acid in the A horizon; strongly acid or very strongly acid in the lower horizons

Content and size of rock fragments: 15 to 35 percent, by volume, in the A horizon and 15 to 70 percent in the

lower horizons; average of more than 35 percent, by volume, in the Bt horizon; ranging dominantly from gravel to stones (fig. 15)

A horizon:
Hue—5YR to 10YR
Value—3 to 5
Chroma—2 to 6
Texture—cobbly loam

E, BA, or BE horizon (if it occurs):
Hue—5YR to 10YR
Value—4 to 6
Chroma—4 to 6
Texture—loam, fine sandy loam, or sandy loam in the fine-earth fraction

Bt horizon:
Hue—5YR to 10YR
Value—4 to 6
Chroma—4 to 8
Texture—clay loam, loam, sandy clay loam, or sandy loam in the fine-earth fraction

C horizon (if it occurs):
Color—similar to the Bt horizon or multicolored
Texture—saprolite; sandy loam or loamy sand in the fine-earth fraction

Cr horizon (if it occurs):
Texture—soft, weathered sillimanite-mica schist bedrock that can be dug with difficulty using hand tools

R horizon:
Texture—hard sillimanite-mica schist bedrock that cannot be dug using hand tools

Cliffside Series

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Landscape position: Piedmont uplands
Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rock, such as sillimanite-mica schist
Slope range: 25 to 45 percent
Commonly associated soils: Pacolet, Rion, Bethlehem, and Ashlar soils on uplands
Taxonomic class: Loamy-skeletal, mixed, thermic Typic Hapludults

Typical Pedon

Cliffside gravelly sandy loam in an area of Rion-Cliffside complex, 25 to 45 percent slopes, very stony; about 0.7 mile northwest of Sandy Plains on North Carolina Highway 9, about 0.8 mile west on Secondary Road 1526, about 300 feet north of the road, in woodland:

A1—0 to 2 inches; dark brown (10YR 3/4) gravelly sandy loam; weak fine granular structure; very friable; many fine, medium, and coarse roots; 20 percent gravel, 5 percent cobbles, and 5 percent stones, by volume; few fine flakes of mica; very strongly acid; clear smooth boundary.
A2—2 to 5 inches; dark yellowish brown (10YR 4/6) gravelly sandy loam; weak fine granular structure; very friable; many fine, medium, and coarse roots; 20 percent gravel, 5 percent cobbles, and 5 percent stones, by volume; few fine and medium flakes of mica; strongly acid; gradual wavy boundary.
Bt1—5 to 18 inches; strong brown (7.5YR 4/6) very cobbly sandy clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; common fine, medium, and coarse roots; 35 percent gravel and 20 percent cobbles, by volume; few fine and medium flakes of mica; strongly acid; gradual wavy boundary.
Bt2—18 to 28 inches; yellowish red (5YR 5/6) very cobbly sandy clay loam; moderate medium subangular blocky structure; friable; slightly sticky, slightly plastic; few fine and medium roots; 35 percent gravel, 20 percent cobbles, and 5 percent stones, by volume; few fine and medium flakes of mica; very strongly acid; abrupt smooth boundary.
R—28 inches; hard, fractured sillimanite-mica schist bedrock; few thin, soft weathered bedrock interlayers.

Range in Characteristics

Thickness of solum: 20 to 40 inches
Depth to bedrock: 20 to 40 inches to hard bedrock
Reaction: Strongly acid or very strongly acid
Content and size of rock fragments: 15 to 35 percent, by volume, in the A horizon and 25 to 70 percent in the lower horizons; average of more than 35 percent, by volume, in the Bt horizon; ranging dominantly from gravel to stones

A horizon:
Hue—5YR to 10YR
Value—3 to 5
Chroma—2 to 6
Texture—gravelly sandy loam

BA or BE horizon (if it occurs):
Hue—5YR to 10YR
Value—4 to 6
Chroma—4 to 6
Texture—sandy loam or loam in the fine-earth fraction

Bt horizon:
Hue—5YR to 10YR

Value—4 to 6
Chroma—4 to 8
Texture—sandy clay loam, clay loam, or loam in the fine-earth fraction

Cr horizon:
Texture—soft, weathered sillimanite-mica schist bedrock that can be dug with difficulty using hand tools

R horizon:
Texture—hard sillimanite-mica schist bedrock that cannot be dug using hand tools

Cowee Series

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Landscape position: Mountain uplands
Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rocks, such as sillimanite-mica schist, biotite gneiss, and migmatitic gneiss
Slope range: 15 to 85 percent
Commonly associated soils: Evard, Cliffield, Fannin, Ashe, Cleveland, and Hayesville soils on uplands; Tate and Greenlee soils in adjacent coves and on hill slopes
Taxonomic class: Fine-loamy, mixed, mesic Typic Hapludults

Typical Pedon

Cowee gravelly sandy loam in an area of Cliffield-Cowee complex, 15 to 30 percent slopes, very stony; about 2.8 miles west of Tryon on Secondary Road 1116, about 100 feet west of the road on a jeep trail, 5 feet south of the trail, in woodland:

A1—0 to 4 inches; dark brown (10YR 3/3) gravelly sandy loam; weak medium granular structure; very friable; many fine and medium and few coarse roots; 18 percent gravel, by volume; few fine flakes of mica; very strongly acid; clear smooth boundary.
A2—4 to 6 inches; dark yellowish brown (10YR 4/6) gravelly sandy loam; weak medium granular structure; very friable; many fine and medium and few coarse roots; 20 percent gravel, by volume; few fine flakes of mica; very strongly acid; clear wavy boundary.
Bt1—6 to 19 inches; yellowish red (5YR 4/6) sandy clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few faint clay films on faces of peds; common fine and medium and few coarse roots; 14 percent gravel, by volume; common fine and medium flakes of mica; very strongly acid; gradual wavy boundary.
Bt2—19 to 25 inches; yellowish red (5YR 4/6) gravelly sandy clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few faint clay films on faces of peds; common fine and medium roots; 15 percent gravel and 5 percent cobbles, by volume; common fine and medium flakes of mica; very strongly acid; abrupt wavy boundary.
Cr—25 to 46 inches; soft, weathered sillimanite-mica schist bedrock.
R—46 inches; hard sillimanite-mica schist bedrock.

Range in Characteristics

Thickness of solum: 15 to 39 inches
Depth to bedrock: 20 to 40 inches to soft, weathered bedrock; typically 40 to 60 inches to hard bedrock
Reaction: Strongly acid to extremely acid
Content and size of rock fragments: 15 to 35 percent, by volume, in the A horizon and 5 to 35 percent in the lower horizons; dominantly gravel

A horizon:
Hue—5YR to 10YR
Value—3 to 5
Chroma—2 to 8
Texture—gravelly sandy loam

BA or BE horizon (if it occurs):
Hue—5YR or 7.5YR
Value—4 to 6
Chroma—4 to 8
Texture—loam, sandy loam, or fine sandy loam in the fine-earth fraction

Bt horizon:
Hue—2.5YR or 5YR
Value—4 to 6
Chroma—4 to 8
Texture—sandy clay loam, clay loam, sandy loam, fine sandy loam, or loam in the fine-earth fraction

BC horizon (if it occurs):
Hue—2.5YR to 7.5YR
Value—4 to 6
Chroma—4 to 8
Texture—sandy clay loam, sandy loam, fine sandy loam, or loam in the fine earth-fraction

C horizon (if it occurs):
Color—similar to the BC horizon or multicolored
Texture—saprolite; loamy in the fine-earth fraction

Cr horizon:
Texture—soft, weathered schist or gneiss bedrock that can be dug with difficulty using hand tools

R horizon:
Texture—hard schist or gneiss bedrock that cannot be dug using hand tools

Dillard Series

Depth class: Very deep
Drainage class: Moderate
Permeability: Moderately slow
Landscape position: Mountain stream terraces and hill slopes
Parent material: Old alluvium derived from mixed geologic sources
Slope range: 1 to 6 percent
Commonly associated soils: Brevard soils in adjacent coves and on hill slopes; Arkaqua soils on adjacent flood plains; Hayesville, Evard, Fannin, and Cowee soils on adjacent uplands
Taxonomic class: Fine-loamy, mixed, mesic Aquic Hapludults

Typical Pedon

Dillard sandy loam, 1 to 6 percent slopes, rarely flooded; about 1.7 miles south of Melrose on Secondary Road 1100, about 0.4 mile west on Secondary Road 1101, about 400 feet south, in a pasture:

Ap—0 to 11 inches; dark brown (10YR 4/3) sandy loam; weak medium granular structure; very friable; many fine and medium roots; few fine flakes of mica; moderately acid; clear smooth boundary.

Bt1—11 to 20 inches; yellowish brown (10YR 5/4) sandy clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few distinct clay films on faces of peds; few fine and medium roots; few fine flakes of mica; moderately acid; gradual wavy boundary.

Bt2—20 to 32 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; friable; slightly sticky, slightly plastic; common medium distinct light brownish gray (10YR 6/2) iron depletions; few coarse yellowish brown (10YR 5/6) iron accumulations; few distinct clay films on faces of peds; few fine roots; common fine flakes of mica; strongly acid; gradual wavy boundary.

BCg—32 to 48 inches; light brownish gray (10YR 6/2) sandy clay loam; moderate medium subangular blocky structure; very friable; slightly sticky, slightly plastic; common medium distinct light yellowish brown (2.5Y 6/4) and prominent brownish yellow (10YR 6/6) iron accumulations; common fine flakes of mica; very strongly acid; clear smooth boundary.

Cg—48 to 65 inches; light brownish gray (2.5Y 6/2) sandy loam; massive; very friable; nonsticky, nonplastic; common medium prominent dark brown (7.5YR 4/4) iron accumulations; common fine flakes of mica; very strongly acid.

Range in Characteristics

Thickness of solum: 30 to greater than 60 inches
Depth to bedrock: Greater than 60 inches
Reaction: Strongly acid or very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Content and size of rock fragments: 0 to 5 percent, by volume, in the A horizon, 0 to 15 percent in the upper part of the B horizon, 0 to 5 percent in the lower part of the B horizon, and 0 to 35 percent in the C horizon; dominantly gravel

Ap horizon:
Hue—10YR
Value—3 to 5
Chroma—1 to 4
Texture—sandy loam

BA horizon (if it occurs):
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—sandy loam or loam

Bt horizon:
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—4 to 8
Redoximorphic features—few to many iron depletions in shades of gray and iron accumulations in shades of yellow, brown, or red
Texture—sandy clay loam or clay loam

BCg horizon:
Hue—10YR
Value—5 to 7
Chroma—1 or 2
Redoximorphic features—common or many iron accumulations in shades of brown or yellow
Texture—sandy clay loam or clay loam

Cg horizon:
Hue—10YR to 5Y
Value—5 to 7
Chroma—1 or 2
Redoximorphic features—common or many iron accumulations in shades of brown or yellow
Texture—variable; horizon is loamy to clayey in the fine-earth fraction or is stratified with these textures

Dogue Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderately slow
Landscape position: Piedmont stream terraces and hill slopes
Parent material: Old alluvium derived from mixed geologic sources
Slope range: 1 to 6 percent
Commonly associated soils: Skyuka, Masada, and Roanoke soils on stream terraces; Chewacla, Riverview, and Wehadkee soils on adjacent flood plains; Cecil, Pacolet, and Appling soils on adjacent uplands
Taxonomic class: Clayey, mixed, thermic Aquic Hapludults

Typical Pedon

Dogue sandy loam in an area of Dogue-Roanoke complex, 0 to 6 percent slopes, rarely flooded; about 1.7 miles east of Columbus on Secondary Road 1137, about 1.9 miles east on Secondary Road 1521, about 1,000 feet south of the road, in a pasture:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) sandy loam; moderate medium granular structure; very friable; many fine and medium roots; few fine flakes of mica; slightly acid; clear smooth boundary.
Bt1—6 to 17 inches; dark yellowish brown (10YR 4/6) clay; moderate medium subangular blocky structure; firm; sticky, plastic; common distinct clay films on faces of peds; few fine and medium roots; few fine flakes of mica; moderately acid; gradual wavy boundary.
Bt2—17 to 23 inches; yellowish brown (10YR 5/4) clay; moderate medium subangular blocky structure; firm; sticky, plastic; common medium distinct yellowish red (5YR 4/6) iron accumulations; coarse pale brown (10YR 6/3) iron depletions; common distinct clay films on faces of peds; few fine roots; few fine flakes of mica; strongly acid; gradual wavy boundary.
Bt3—23 to 31 inches; yellowish brown (10YR 5/4) clay; moderate medium subangular blocky structure; firm; sticky, plastic; common coarse distinct light brownish gray (2.5Y 6/2) iron depletions; common medium prominent dark reddish brown (5YR 3/4) iron accumulations; few distinct clay films on faces of peds; few fine flakes of mica; very strongly acid; gradual wavy boundary.
Btg—31 to 41 inches; light gray (2.5Y 7/2) clay; moderate medium subangular blocky structure; firm; sticky, plastic; common medium prominent strong brown (7.5YR 5/8) and brownish yellow (10YR 6/6) iron accumulations; few faint clay films on faces of peds; few fine flakes of mica; very strongly acid; clear smooth boundary.
BCg—41 to 58 inches; gray (10YR 6/1) sandy clay; moderate medium subangular blocky structure; firm; sticky, plastic; common medium distinct light yellowish brown (2.5Y 6/4) iron accumulations; few fine flakes of mica; very strongly acid; clear smooth boundary.
Cg—58 to 62 inches; gray (10YR 5/1) sandy clay loam; massive; friable; slightly sticky, slightly plastic; few fine flakes of mica; very strongly acid.

Range in Characteristics

Thickness of solum: 40 to greater than 60 inches
Depth to bedrock: Greater than 60 inches
Reaction: Strongly acid to extremely acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Content and size of rock fragments: 0 to 15 percent, by volume, in the A and B horizons and 0 to 25 percent in the C horizon; dominantly gravel

Ap horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—sandy loam

BA horizon (if it occurs):
Hue—7.5YR to 2.5Y
Value—4 to 7
Chroma—4 to 8
Texture—sandy clay loam, clay loam, or loam

Bt horizon:
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—4 to 8
Redoximorphic features—few to many iron depletions in shades of gray and iron accumulations in shades of yellow, brown, or red
Texture—clay, clay loam, sandy clay loam, or sandy clay

Btg horizon:
Hue—horizon is neutral in hue or has hue of 7.5YR to 2.5Y
Value—4 to 7
Chroma—0 or 2
Redoximorphic features—few or common iron depletions in shades of gray and iron accumulations in shades of brown or yellow
Texture—similar to the Bt horizon

BCg horizon:
Color—similar to the Btg horizon
Texture—sandy clay, clay loam, sandy clay loam, or sandy loam

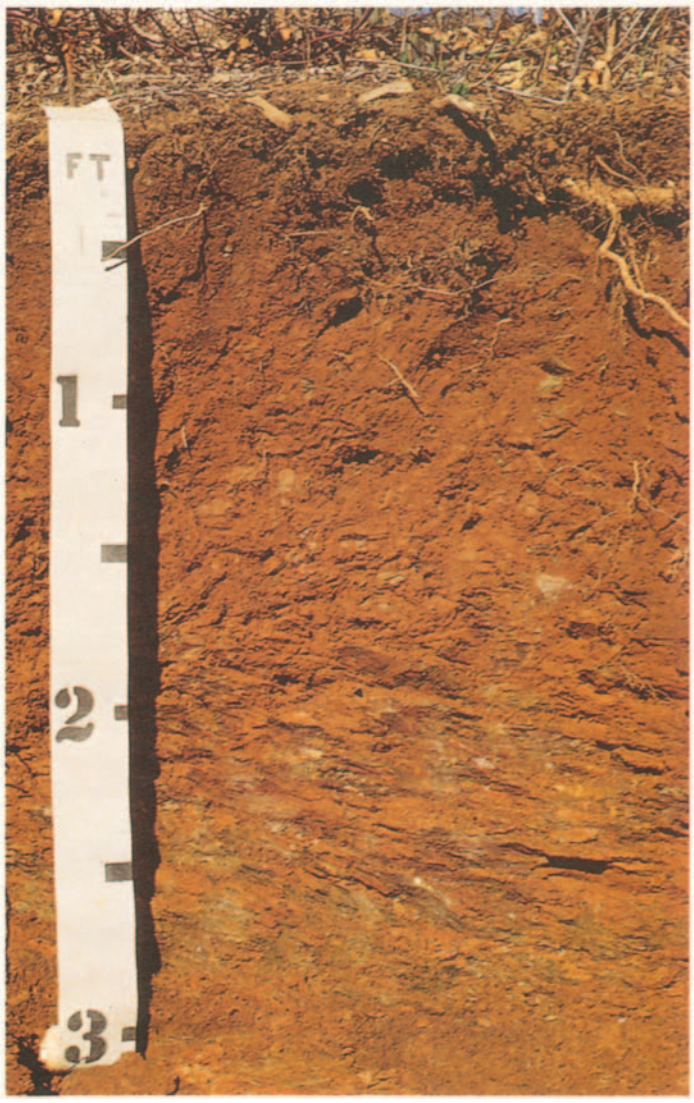

Figure 14.—Profile of Bethlehem soil. Soft, weathered sillimanite schist bedrock is at a depth of 23 inches.

Figure 15.—Profile of Cleveland soil. Hard migmatitic gneiss bedrock is at a depth of about 14 inches.

Figure 16.—Profile of Cliffield soil. In this soil, the depth to hard sillimanite schist bedrock ranges from 20 to 30 inches. The soil contains more than 35 percent rock fragments, by volume.

Figure 17.—Profile of Greenlee soil. The subsoil is at a depth of about 8 inches. It contains 35 percent rock fragments, by volume. Greenlee soils formed in colluvium.

Figure 18.—Profile of Ostin soil. The C horizon contains as much as 80 percent rock fragments, by volume. Ostin soils occur along channels of fast-flowing streams in mountainous areas.

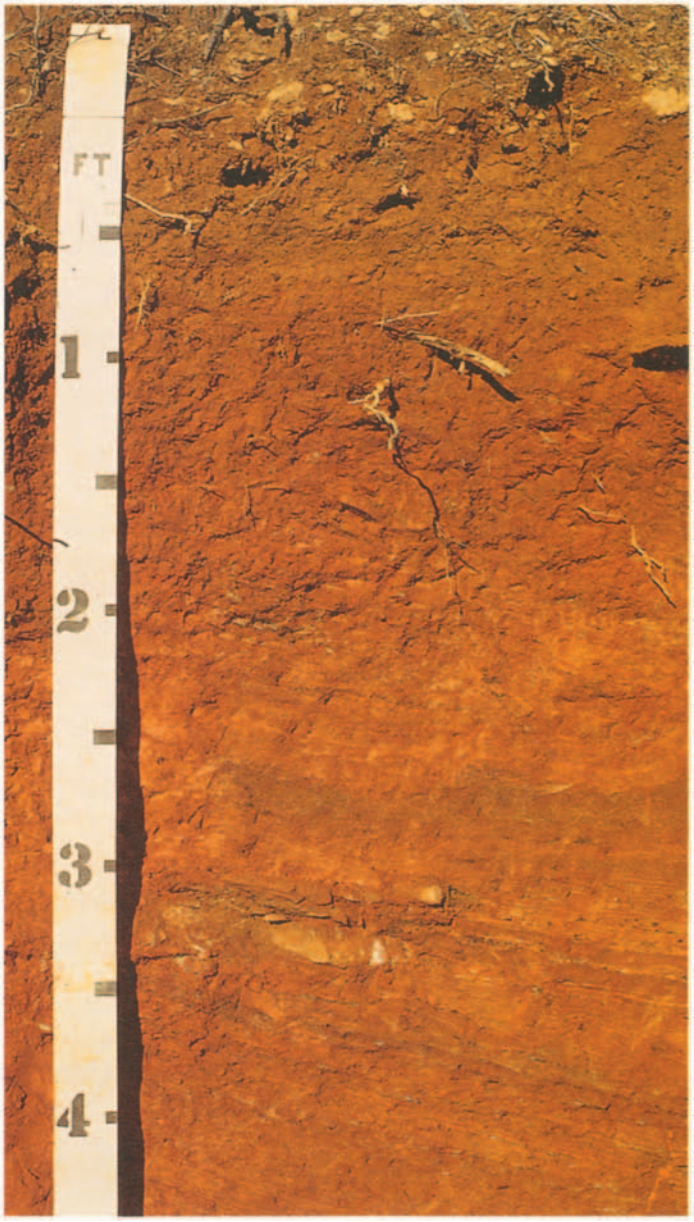

Figure 19.—Profile of Pacolet soil. The surface layer of brown sandy clay loam is 8 inches thick. The subsoil of red clay is at depths between 8 and 24 inches. Loamy saprolite extends below a depth of 60 inches.

Figure 20.—Profile of Skyuka soil. The surface layer is dark brown clay loam about 9 inches thick. It overlies a subsoil of yellowish red clay loam and clay. Skyuka soils are less acid than most of the soils in Polk County.

Figure 21.—Profile of Tate soil, which is mapped with Greenlee soils. The subsoil of Tate soils contains less than 35 percent rock fragments, by volume. Greenlee soils have a larger percentage of rock fragments.

Cg horizon:
Color—similar to the Btg horizon
Texture—stratified sandy and loamy textures in the fine-earth fraction

Edneyville Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Landscape position: Mountain uplands
Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rocks, such as biotite gneiss, migmatitic gneiss, and porphyroblastic gneiss
Slope range: 50 to 95 percent
Commonly associated soils: Chestnut, Evard, Cowee, Cliffield, Ashe, and Cleveland soils on uplands; Tate and Greenlee soils in adjacent coves and on hill slopes
Taxonomic class: Coarse-loamy, mixed, mesic Typic Dystrochrepts

Typical Pedon

Edneyville sandy loam in an area of Edneyville-Chestnut complex, 50 to 95 percent slopes, stony; about 0.7 mile west on Secondary Road 1154 from the Henderson-Polk County line, 1.3 miles southwest on an old logging road on the southeast side of Pulliam Creek, 0.4 mile east on the road, 5 feet north of the road, in woodland:

A—0 to 3 inches; dark brown (10YR 4/3) sandy loam; weak fine granular structure; very friable; many fine and medium and common coarse roots; few fine flakes of mica; strongly acid; clear smooth boundary.
Bw1—3 to 14 inches; yellowish brown (10YR 5/4) sandy loam; weak fine subangular blocky structure; very friable; common fine, medium, and coarse roots; few fine and medium flakes of mica; strongly acid; gradual wavy boundary.
Bw2—14 to 31 inches; yellowish brown (10YR 5/6) sandy loam; weak fine subangular blocky structure; very friable; common fine, medium, and coarse roots; few fine and medium flakes of mica; very strongly acid; gradual wavy boundary.
C—31 to 65 inches; saprolite consisting of light yellowish brown (10YR 6/4), light brown (7.5YR 6/4), and white (10YR 8/2) loamy sand; massive; loose; few fine and medium roots; 5 percent gravel, by volume; few fine and medium flakes of mica; very strongly acid.

Range in Characteristics

Thickness of solum: 20 to 55 inches
Depth to bedrock: Greater than 60 inches
Reaction: Moderately acid to very strongly acid
Content and size of rock fragments: 0 to 15 percent, by volume, in the A horizon and 0 to 35 percent in the lower horizons; dominantly gravel

A horizon:
Hue—7.5YR to 2.5Y
Value—2 to 5
Chroma—1 to 4
Texture—sandy loam

Bw horizon:
Hue—7.5YR to 2.5Y
Value—4 to 7
Chroma—3 to 8
Texture—sandy loam, fine sandy loam, or loam in the fine-earth fraction

BC horizon (if it occurs):
Color—similar to the Bw horizon
Texture—similar to the Bw horizon

C horizon:
Color—similar to the Bw horizon or multicolored
Texture—saprolite consisting of variable textures; ranging from loamy sand to loam in the fine-earth fraction

Evard Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape position: Mountain uplands
Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rock, such as biotite gneiss
Slope range: 15 to 85 percent
Commonly associated soils: Hayesville, Cowee, Cliffield; Fannin, Ashe, and Cleveland soils on uplands; Tate and Greenlee soils in adjacent coves and on hill slopes
Taxonomic class: Fine-loamy, oxidic, mesic Typic Hapludults

Typical Pedon

Evard sandy loam in an area of Evard-Cowee complex, 30 to 50 percent slopes, stony; about 0.4 mile west of Saluda on U.S. Highway 176, about 0.7 mile northeast on Secondary Road 1181, about 1.6 miles northeast on Secondary Road 1142, about 1.0 mile north on Secondary Road 1153 to the Boy Scout Camp pond, 0.5 mile east on a gravel road on the south side of the pond, 15 feet south of the road, in woodland:

A—0 to 4 inches; brown (10YR 5/3) sandy loam; weak

fine granular structure; very friable; many fine and medium and few coarse roots; 5 percent gravel, by volume; few fine flakes of mica; very strongly acid; clear smooth boundary.

BA—4 to 7 inches; strong brown (7.5YR 5/8) sandy clay loam; weak medium subangular blocky structure; very friable; common fine and medium roots; few fine flakes of mica; strongly acid; gradual wavy boundary.

Bt—7 to 21 inches; yellowish red (5YR 5/6) clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few faint clay films on faces of peds; few fine and medium roots; few fine and medium flakes of mica; strongly acid; gradual wavy boundary.

BC—21 to 27 inches; yellowish red (5YR 5/8) sandy clay loam; common medium distinct strong brown (7.5YR 5/8) mottles; weak fine subangular blocky structure; friable; slightly sticky, slightly plastic; few fine and medium roots; 5 percent gravel, by volume; few fine and medium flakes of mica; strongly acid; gradual wavy boundary.

C1—27 to 48 inches; saprolite consisting of yellowish red (5YR 5/8) and strong brown (7.5YR 5/6) sandy loam; massive; very friable; 5 percent gravel, by volume; common fine and medium flakes of mica; moderately acid; gradual wavy boundary.

C2—48 to 65 inches; saprolite consisting of strong brown (7.5YR 5/8) sandy loam; massive; very friable; few fine flakes of mica; strongly acid.

Range in Characteristics

Thickness of solum: 20 to more than 40 inches
Depth to bedrock: Greater than 60 inches
Reaction: Moderately acid to very strongly acid
Content and size of rock fragments: 0 to 15 percent, by volume, throughout the profile; dominantly gravel

A horizon:
Hue—5YR to 10YR
Value—3 to 5
Chroma—3 to 6
Texture—sandy loam

BA horizon:
Hue—5YR to 10YR
Value—4 to 8
Chroma—4 to 8
Texture—sandy clay loam, loam, fine sandy loam, sandy loam, or clay loam

Bt horizon:
Hue—2.5YR or 5YR
Value—4 or 5
Chroma—4 to 8
Texture—clay loam, sandy clay loam, or loam

BC horizon:
Hue—2.5YR to 7.5YR
Value—4 to 6
Chroma—6 or 8
Mottles (if they occur)—few or common in shades of red, brown, or yellow
Texture—sandy clay loam, fine sandy loam, loam, sandy loam, or clay loam

C horizon:
Color—similar to the BC horizon or multicolored
Texture—saprolite consisting of variable textures; ranging from loam to loamy sand

Fannin Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape position: Mountain uplands
Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rock, such as migmatitic gneiss that has a high content of mica
Slope range: 15 to 85 percent
Commonly associated soils: Hayesville, Cowee, Cliffield, Evard, Ashe, and Cleveland soils on uplands; Tate and Greenlee soils in adjacent coves and on hill slopes
Taxonomic class: Fine-loamy, micaceous, mesic Typic Hapludults

Typical Pedon

Fannin fine sandy loam in an area of Fannin-Cowee complex, 30 to 50 percent slopes, stony; about 1.7 miles west of Columbus on Secondary Road 1135, about 0.8 mile north on Secondary Road 1136, about 200 feet northeast of the road, in woodland:

A1—0 to 2 inches; dark brown (10YR 3/3) fine sandy loam; weak fine granular structure; very friable; many fine and medium and few coarse roots; common fine flakes of mica; strongly acid; clear smooth boundary.

A2—2 to 4 inches; yellowish brown (10YR 5/4) fine sandy loam; weak fine granular structure; very friable; many fine and medium and few coarse roots; common fine flakes of mica; strongly acid; clear wavy boundary.

Bt1—4 to 16 inches; yellowish red (5YR 4/6) clay loam; moderate medium subangular blocky structure; friable; slightly sticky, slightly plastic; few faint clay films on faces of peds; common fine and medium roots; common fine flakes of mica; moderately acid; gradual wavy boundary.

Bt2—16 to 26 inches; yellowish red (5YR 4/6) sandy clay

loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few faint clay films on faces of peds; few fine and medium roots; many fine flakes of mica; moderately acid; gradual wavy boundary.

BC—26 to 34 inches; red (2.5YR 4/8) and yellowish red (5YR 4/6) sandy clay loam; common dark reddish brown (5YR 3/2) pockets of fine sandy loam; moderate medium subangular blocky structure; friable; slightly sticky, slightly plastic; few fine and medium roots; many fine flakes of mica; slightly acid; gradual wavy boundary.

C1—34 to 52 inches; saprolite consisting of yellowish red (5YR 5/8), dark reddish brown (5YR 3/2), and red (2.5YR 4/8) fine sandy loam; massive; very friable; many fine flakes of mica; slightly acid; gradual wavy boundary.

C2—52 to 65 inches; saprolite consisting of dark brown (7.5YR 3/4), very pale brown (10YR 7/3), and yellowish brown (10YR 5/6) fine sandy loam; massive; very friable; many fine flakes of mica; moderately acid.

Range in Characteristics

Thickness of solum: 20 to 45 inches
Depth to bedrock: Greater than 60 inches
Reaction: Slightly acid to very strongly acid
Content and size of rock fragments: 0 to 15 percent, by volume, throughout the profile; dominantly gravel

A horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—2 to 4
Texture—fine sandy loam

BA horizon (if it occurs):
Hue—5YR
Value—4 or 5
Chroma—4 to 6
Texture—loam or fine sandy loam

Bt horizon:
Hue—2.5YR or 5YR
Value—4 or 5
Chroma—4 to 8
Texture—clay loam, sandy clay loam, or loam

BC horizon:
Color—similar to the Bt horizon
Texture—sandy clay loam, loam, fine sandy loam, or sandy loam

C horizon:
Color—similar to the BC horizon or multicolored
Texture—loamy saprolite that has a high content of mica

Greenlee Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Landscape position: Mountain coves and hill slopes
Parent material: Colluvium derived from mixed geologic sources
Slope range: 8 to 60 percent
Commonly associated soils: Tate soils in coves and on hill slopes; Ostin soils on adjacent flood plains; Evard, Cowee, Fannin, Ashe, and Cleveland soils on adjacent uplands
Taxonomic class: Loamy-skeletal, mixed, mesic Typic Dystrochrepts

Typical Pedon

Greenlee cobbly sandy loam in an area of Tate-Greenlee complex, 30 to 60 percent slopes, extremely bouldery; about 2.5 miles northwest of Sunnyview on Secondary Road 1161, about 0.6 mile southwest on Secondary Road 1162, about 0.9 mile northwest on Secondary Road 1163, about 0.7 mile southwest on a private development road, 0.2 mile on an old logging road, 5 feet northwest of the road, in woodland:

A1—0 to 4 inches; dark brown (10YR 3/3) cobbly sandy loam; weak fine granular structure; very friable; many fine and medium and common coarse roots; 15 percent cobbles, 5 percent stones, and 5 percent gravel, by volume; few fine flakes of mica; strongly acid; clear smooth boundary.

A2—4 to 11 inches; dark yellowish brown (10YR 4/4) cobbly sandy loam; weak fine granular structure; very friable; many fine and medium and common coarse roots; 10 percent cobbles, 10 percent stones, and 5 percent gravel, by volume; few fine flakes of mica; strongly acid; gradual smooth boundary.

Bw1—11 to 27 inches; dark yellowish brown (10YR 4/6) very cobbly sandy loam; weak fine subangular blocky structure; friable; common fine and medium roots; 35 percent cobbles, 10 percent stones, and 10 percent gravel, by volume; few fine and medium flakes of mica; strongly acid; gradual wavy boundary.

Bw2—27 to 51 inches; yellowish brown (10YR 5/6) very cobbly sandy loam; weak medium subangular blocky structure; friable; few fine and medium roots; 30 percent cobbles, 10 percent stones, and 5 percent gravel, by volume; few fine and medium flakes of mica; strongly acid; gradual wavy boundary.

Bw3—51 to 74 inches; strong brown (7.5YR 5/6) very cobbly sandy loam; weak medium subangular blocky structure; friable; few fine roots; 30 percent cobbles, 10 percent stones, and 5 percent gravel, by volume;

few fine and medium flakes of mica; very strongly acid.

Range in Characteristics

Thickness of solum: 20 to greater than 60 inches
Depth to bedrock: Greater than 60 inches
Reaction: Strongly acid to extremely acid
Content and size of rock fragments: 15 to 35 percent, by volume, in the A horizon and 15 to 80 percent in the lower horizons; average of more than 35 percent, by volume, in the Bw horizon; ranging dominantly from gravel to stones and including boulders in some areas (fig. 17)

A horizon:
Hue—7.5YR or 10YR
Value—2 to 5
Chroma—1 to 4
Texture—cobbly sandy loam

BA horizon (if it occurs):
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—sandy loam, loam, or sandy clay loam in the fine-earth fraction

Bw horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 8
Texture—same as the BA horizon in the fine-earth fraction

BC horizon (if it occurs):
Hue—7.5YR to 10YR
Value—4 to 6
Chroma—3 to 6
Texture—loam, sandy loam, loamy sand, fine sandy loam, or loamy fine sand in the fine-earth fraction

C horizon (if it occurs):
Color—similar to the BC horizon
Texture—loamy to sandy in the fine-earth fraction

Grover Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape position: Piedmont uplands
Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rock, such as migmatitic gneiss that has a high content of mica
Slope range: 25 to 45 percent
Commonly associated soils: Madison, Pacolet, Rion, and Ashlar soils on uplands
Taxonomic class: Fine-loamy, micaceous, thermic Typic Hapludults

Typical Pedon

Grover loam, 25 to 45 percent slopes; about 0.5 mile northwest of Pea Ridge on North Carolina Highway 108, about 0.5 mile north on Secondary Road 1311, about 0.3 mile northeast of this road on a logging road, 100 feet southeast, in woodland:

A—0 to 6 inches; brown (7.5YR 4/4) loam; weak medium granular structure; very friable; many fine, medium, and coarse roots; common fine and medium flakes of mica; very strongly acid; clear smooth boundary.
Bt—6 to 20 inches; yellowish red (5YR 5/6) loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few faint clay films on faces of peds; many fine and medium and few coarse roots; many fine flakes of mica; very strongly acid; gradual wavy boundary.
BC—20 to 25 inches; yellowish red (5YR 4/6) loam; weak medium subangular blocky structure; very friable; few fine and medium roots; many fine and medium flakes of mica; strongly acid; gradual wavy boundary.
C1—25 to 35 inches; saprolite consisting of strong brown (7.5YR 4/6) sandy loam; common very dark brown (10YR 2/2) streaks; massive; very friable; few fine and medium roots; many fine and medium flakes of mica; very strongly acid; clear smooth boundary.
C2—35 to 65 inches; saprolite consisting of multicolored sandy loam; massive; very friable; few fine and medium roots; many fine and medium flakes of mica; very strongly acid.

Range in Characteristics

Thickness of solum: 20 to 40 inches
Depth to bedrock: Greater than 60 inches
Reaction: Moderately acid to very strongly acid
Content and size of rock fragments: 0 to 10 percent, by volume, in the A and B horizons and 0 to 15 percent in the C horizon; dominantly gravel

A horizon:
Hue—7.5YR to 2.5Y
Value—3 to 5
Chroma—2 to 6
Texture—loam

E horizon (if it occurs):
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—3 to 8
Texture—loam, sandy loam, or fine sandy loam

BA or BE horizon (if it occurs):
Hue—5R to 10YR
Value—4 to 6
Chroma—4 to 8
Texture—loam, fine sandy loam, sandy loam, or sandy clay loam

Bt horizon:
Hue—2.5YR to 10YR
Value—4 to 6
Chroma—4 to 8
Texture—loam, sandy clay loam, or clay loam

BC horizon:
Color—similar to the Bt horizon
Texture—loam, fine sandy loam, sandy loam, or sandy clay loam

C horizon:
Color—similar to the BC horizon or multicolored
Texture—loamy saprolite that has a high content of mica

Hayesville Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape position: Mountain uplands
Parent material: Residuum that weathered mainly from high-grade metamorphic rocks, such as biotite gneiss and migmatitic gneiss
Slope range: 8 to 30 percent
Commonly associated soils: Evard, Cowee, and Fannin soils on uplands; Brevard soils in adjacent coves and on hill slopes
Taxonomic class: Clayey, kaolinitic, mesic Typic Kanhapludults

Typical Pedon

Hayesville fine sandy loam, 15 to 30 percent slopes; about 0.4 mile west of Saluda on U.S. Highway 176, about 0.4 mile northeast on Secondary Road 1181, about 0.1 mile north on Secondary Road 1145, about 0.1 mile west on a paved development road, 50 feet west of the road, in woodland:

A—0 to 7 inches; yellowish brown (10YR 4/4) fine sandy loam; weak medium granular structure; very friable; many fine and medium and few coarse roots; few fine flakes of mica; very strongly acid; clear smooth boundary.
BA—7 to 10 inches; yellowish red (5YR 5/6) clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; common fine and medium roots; few fine flakes of mica; very strongly acid; gradual wavy boundary.
Bt—10 to 21 inches; red (2.5YR 4/6) clay; moderate medium subangular blocky structure; firm; sticky, plastic; few faint clay films on faces of peds; few fine and medium roots; few fine flakes of mica; very strongly acid; gradual wavy boundary.
BC—21 to 38 inches; yellowish red (5YR 4/6) clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few fine flakes of mica; very strongly acid; gradual wavy boundary.
C1—38 to 56 inches; saprolite consisting of yellowish red (5YR 5/8) loam; few pockets of clay loam; massive; very friable; common fine flakes of mica; very strongly acid; gradual wavy boundary.
C2—56 to 65 inches; saprolite consisting of mottled yellowish red (5YR 5/8), strong brown (7.5YR 5/8), and reddish yellow (7.5YR 7/8) fine sandy loam; massive; very friable; common fine flakes of mica; very strongly acid.

Range in Characteristics

Thickness of solum: 30 to 60 inches
Depth to bedrock: Greater than 60 inches
Reaction: Moderately acid to extremely acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Content and size of rock fragments: 0 to 15 percent, by volume, throughout the profile; dominantly gravel

A horizon:
Hue—5YR to 10YR
Value—3 to 6
Chroma—2 to 6
Texture—fine sandy loam

BA horizon:
Hue—5YR to 10YR
Value—4 to 6
Chroma—4 to 8
Texture—clay loam, loam, or sandy clay loam

Bt horizon:
Hue—10R to 5YR
Value—4 or 5
Chroma—6 or 8
Texture—clay or clay loam

BC horizon:
Hue—10R to 7.5YR
Value—4 to 6
Chroma—6 or 8
Texture—clay loam, sandy clay loam, or loam

C horizon:
Color—similar to the BC horizon or multicolored
Texture—loamy saprolite

Hiwassee Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape position: Piedmont stream terraces and uplands
Parent material: Old alluvium or residuum that weathered mainly from high-grade metamorphic rock, such as migmatitic gneiss
Slope range: 2 to 15 percent
Commonly associated soils: Madison, Pacolet, and Grover soils on uplands; Skyuka, Dogue, and Roanoke soils on stream terraces
Taxonomic class: Clayey, kaolinitic, thermic Typic Kanhapludults

Typical Pedon

Hiwassee clay loam, 2 to 8 percent slopes, eroded; about 4.3 miles northeast of Sandy Plains on Secondary Road 1005, about 1.8 miles south on Secondary Road 1326, about 100 feet north of the road, in woodland:

Ap—0 to 7 inches; dark reddish brown (2.5YR 2.5/4) clay loam; moderate medium granular structure; friable; many fine and medium and few coarse roots; few fine flakes of mica; moderately acid; clear smooth boundary.
Bt1—7 to 21 inches; dark red (2.5YR 3/6) clay; moderate medium subangular blocky structure; firm; sticky, plastic; few faint clay films on faces of peds; few fine, medium, and coarse roots; few fine flakes of mica; strongly acid; gradual wavy boundary.
Bt2—21 to 46 inches; red (2.5YR 4/6) clay; moderate medium subangular blocky structure; firm; sticky, plastic; few faint clay films on faces of peds; few fine and medium roots; few fine flakes of mica; strongly acid; gradual wavy boundary.
Bt3—46 to 58 inches; red (2.5YR 4/8) clay loam; moderate medium subangular blocky structure; friable; slightly sticky, slightly plastic; few faint clay films on faces of peds; common fine flakes of mica; strongly acid; gradual wavy boundary.
BC—58 to 65 inches; red (2.5YR 4/8) clay loam; few medium distinct yellowish red (5YR 4/6) mottles; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; common fine flakes of mica; strongly acid.

Range in Characteristics

Thickness of solum: 40 to more than 60 inches
Depth to bedrock: Greater than 60 inches
Reaction: Slightly acid to very strongly acid
Content and size of rock fragments: 0 to 15 percent, by volume, in the A horizon and 0 to 10 percent in the lower horizons; dominantly gravel

Ap horizon:
Hue—10R to 5YR
Value—2.5 or 3
Chroma—3 or 4
Texture—clay loam

Bt horizon:
Hue—10R or 2.5YR
Value—3 in the upper part; 3 or 4 in the lower part
Chroma—4 to 8
Texture—clay, sandy clay, or clay loam

BC horizon:
Hue—10R or 2.5YR
Value—4 or 5
Chroma—4 to 8
Mottles—few in shades of yellow or brown; occurring randomly
Texture—clay loam or sandy clay loam

C horizon (if it occurs):
Color—similar to the BC horizon or multicolored
Texture—loamy saprolite

Madison Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape position: Piedmont uplands
Parent material: Residuum that weathered mainly from high-grade metamorphic rock, such as migmatitic gneiss that has a high content of mica
Slope range: 8 to 25 percent
Commonly associated soils: Pacolet, Cecil, and Grover soils on uplands; Hiwassee soils on uplands and adjacent stream terraces
Taxonomic class: Clayey, kaolinitic, thermic Typic Kanhapludults

Typical Pedon

Madison sandy clay loam, 8 to 15 percent slopes, eroded; about 5.8 miles north of Mill Spring on North Carolina Highway 108, about 500 feet north of the highway, in woodland:

Ap—0 to 6 inches; brown (7.5YR 4/4) sandy clay loam; moderate medium granular structure; friable; many fine and medium and common coarse roots; few fine flakes of mica; strongly acid; clear smooth boundary.
Bt1—6 to 21 inches; red (2.5YR 4/6) clay; moderate medium subangular blocky structure; firm; sticky, plastic; few distinct clay films on faces of peds;

common fine and medium and few coarse roots; common fine flakes of mica; moderately acid; gradual wavy boundary.

Bt2—21 to 26 inches; red (2.5YR 4/6) clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few faint clay films on faces of peds; few fine and medium roots; many fine flakes of mica; moderately acid; gradual wavy boundary.

BC—26 to 37 inches; red (2.5YR 4/8) clay loam; weak fine subangular blocky structure; very friable; slightly sticky, slightly plastic; many fine flakes of mica; moderately acid; gradual wavy boundary.

C—37 to 65 inches; saprolite consisting of dark reddish brown (5YR 3/2), yellowish red (5YR 5/8), and reddish yellow (7.5YR 6/8) coarse sandy loam; massive; very friable; many fine flakes of mica; strongly acid.

Range in Characteristics

Thickness of solum: 20 to 50 inches
Depth to bedrock: Greater than 60 inches
Reaction: Moderately acid to very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Content and size of rock fragments: 0 to 15 percent, by volume, throughout the profile; dominantly gravel

Ap horizon:
Hue—5YR to 10YR
Value—4 or 5
Chroma—3 to 8
Texture—sandy clay loam

Bt horizon:
Hue—10R to 5YR
Value—4 to 6
Chroma—3 to 8
Texture—clay, clay loam, or sandy clay

BC horizon:
Hue—10R to 5YR
Value—4 to 6
Chroma—3 to 8
Mottles (if they occur)—few in shades of yellow or brown; occurring randomly
Texture—clay loam, sandy clay loam, loam, or sandy loam

C horizon:
Color—similar to the BC horizon or multicolored
Texture—loamy saprolite that has a high content of mica

Masada Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape position: Piedmont stream terraces
Parent material: Old alluvium derived from mixed geologic sources
Slope range: 2 to 8 percent
Commonly associated soils: Dogue and Roanoke soils on stream terraces; Riverview, Chewacla, Ostin, and Buncombe soils on adjacent flood plains; Tate and Greenlee soils in adjacent mountain coves and on hill slopes
Taxonomic class: Clayey, mixed, thermic Typic Hapludults

Typical Pedon

Masada sandy loam, 2 to 8 percent slopes; about 0.2 mile northwest of Columbus on Secondary Road 1135, about 1.4 miles northeast on Secondary Road 1137, about 2,000 feet northwest of the road, in woodland:

Ap—0 to 9 inches; brown (10YR 5/3) sandy loam; weak fine granular structure; very friable; many fine and medium and common coarse roots; few fine flakes of mica; moderately acid; clear smooth boundary.

BA—9 to 18 inches; strong brown (7.5YR 4/6) sandy clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; common fine and medium and few coarse roots; few fine flakes of mica; moderately acid; gradual wavy boundary.

Bt1—18 to 24 inches; yellowish red (5YR 5/8) clay; moderate medium subangular blocky structure; firm; sticky, plastic; common distinct clay films on faces of peds; few fine and medium roots; few fine flakes of mica; strongly acid; gradual wavy boundary.

Bt2—24 to 31 inches; yellowish red (5YR 5/8) clay; few fine prominent red (2.5YR 5/8) and brownish yellow (10YR 6/8) mottles; moderate medium subangular blocky structure; firm; sticky, plastic; common distinct clay films on faces of peds; few fine roots; few fine flakes of mica; strongly acid; gradual wavy boundary.

Bt3—31 to 40 inches; strong brown (7.5YR 5/8) clay; common medium distinct yellowish red (5YR 5/8) and few fine distinct brownish yellow (10YR 6/8) mottles; moderate medium subangular blocky structure; firm; sticky, plastic; few faint clay films on faces of peds; few fine flakes of mica; strongly acid; gradual wavy boundary.

BC—40 to 55 inches; brownish yellow (10YR 6/6) sandy clay; common medium distinct yellowish red (5YR 5/8) mottles; moderate medium subangular blocky structure; firm; sticky, plastic; 5 percent gravel, by volume; few fine flakes of mica; strongly acid; gradual wavy boundary.

C—55 to 65 inches; yellowish red (5YR 5/8), brownish yellow (10YR 6/6), and red (2.5YR 4/8) sandy clay loam; weak medium subangular blocky structure;

friable; slightly sticky, slightly plastic; few fine flakes of mica; strongly acid.

Range in Characteristics

Thickness of solum: 40 to 60 inches
Depth to bedrock: Greater than 60 inches
Reaction: Strongly acid or very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Content and size of rock fragments: 0 to 15 percent, by volume, in the A and BA horizons and 0 to 35 percent in the lower horizons; dominantly gravel

Ap horizon:
Hue—7.5YR to 2.5Y
Value—3 to 8
Chroma—1 to 8
Texture—sandy loam

BA horizon:
Hue—5YR to 10YR
Value—4 to 6
Chroma—4 to 8
Texture—sandy clay loam, clay loam, or loam

Bt horizon:
Hue—5YR to 10YR
Value—4 to 6
Chroma—4 to 8
Mottles—few to many in shades of red, yellow, or brown
Texture—clay, sandy clay, or clay loam in the fine-earth fraction

BC horizon:
Hue—2.5YR to 10YR
Value—4 to 6
Chroma—4 to 8
Mottles—common or many in shades of red, yellow, or brown
Texture—sandy clay, clay, clay loam, or sandy clay loam in the fine-earth fraction

C horizon (if it occurs):
Color—similar the BC horizon or multicolored
Texture—loamy in the fine-earth fraction

Ostin Series

Depth class: Very deep
Drainage class: Moderately well drained and well drained
Permeability: Rapid and very rapid
Landscape position: Narrow flood plains along streams that flow from extremely stony or extremely bouldery mountain coves and hill slopes
Parent material: Recent alluvium derived from mixed geologic sources
Slope range: 1 to 3 percent
Commonly associated soils: Tate and Greenlee soils in adjacent coves and on hill slopes; Masada, Dogue, and Roanoke soils on adjacent stream terraces
Taxonomic class: Sandy-skeletal, mixed, mesic Typic Udifluvents

Typical Pedon

Ostin loamy sand, 1 to 3 percent slopes, occasionally flooded; about 0.1 mile north of Mill Spring on North Carolina Highway 9, about 5.2 miles northwest on Secondary Road 1138, about 0.9 mile west on Secondary Road 1155, about 120 feet north of the road, in a pasture:

Ap—0 to 6 inches; dark brown (10YR 4/3) loamy sand; weak medium granular structure; very friable; many very fine and fine roots; 5 percent gravel and 5 percent cobbles, by volume; common fine and medium flakes of mica; slightly acid; clear smooth boundary.
C1—6 to 11 inches; dark yellowish brown (10YR 4/6) loamy sand; many thin lenses of strong brown (7.5YR 5/6) sand; single grained; loose; common very fine and fine roots; 10 percent gravel, by volume; common fine flakes of mica; neutral; clear smooth boundary.
C2—11 to 22 inches; yellowish brown (10YR 5/4) very cobbly coarse sand; single grained; loose; few very fine and fine roots; 30 percent cobbles and 25 percent gravel, by volume; few fine and medium flakes of mica; neutral; abrupt smooth boundary.
C3—22 to 28 inches; yellowish brown (10YR 5/4) gravelly coarse sand; single grained; loose; few very fine roots; 15 percent gravel, by volume; few fine and medium flakes of mica; neutral; clear smooth boundary.
C4—28 to 60 inches; yellowish brown (10YR 5/6) extremely gravelly coarse sand; single grained; loose; 55 percent gravel and 20 percent cobbles, by volume; few fine and medium flakes of mica; neutral.

Range in Characteristics

Depth to bedrock: Greater than 60 inches
Reaction: Neutral to very strongly acid throughout the profile
Content and size of rock fragments: 5 to 35 percent, by volume, in the A horizon and 5 to 80 percent in the C horizon; average of more than 35 percent, by volume, in the C horizon; ranging dominantly from gravel to cobbles (fig. 18)

Ap horizon:
Hue—10YR

Value—3 or 5
Chroma—1 to 6
Texture—loamy sand

C horizon:
Hue—10YR or 7.5YR
Value—4 or 6 or multicolored
Chroma—3 to 8
Redoximorphic features—none or few in shades of gray below a depth of 20 inches
Texture—loamy sand, sand, or coarse sand in the fine-earth fraction

Pacolet Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape position: Piedmont uplands
Parent material: Residuum that weathered mainly from high-grade metamorphic rocks, such as biotite gneiss, porphyroblastic gneiss, migmatitic gneiss, and sillimanite-mica schist
Slope range: 8 to 25 percent
Commonly associated soils: Madison, Bethlehem, Cecil, and Rion soils on uplands
Taxonomic class: Clayey, kaolinitic, thermic Typic Kanhapludults

Typical Pedon

Pacolet sandy clay loam, 15 to 25 percent slopes, eroded; about 4.7 miles north of Mill Spring on North Carolina Highway 9, about 0.6 mile northeast on Secondary Road 1159, about 600 feet northwest of the road, in an orchard:

Ap—0 to 5 inches; brown (7.5YR 4/4) sandy clay loam; moderate medium granular structure; friable; many fine and medium roots; few fine flakes of mica; slightly acid; clear smooth boundary.
Bt1—5 to 20 inches; red (2.5YR 4/8) clay; moderate medium subangular blocky structure; firm; sticky, plastic; common distinct clay films on faces of peds; common fine and medium roots; few fine flakes of mica; moderately acid; gradual wavy boundary.
Bt2—20 to 29 inches; red (2.5YR 4/8) clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few faint clay films on faces of peds; few fine roots; few fine flakes of mica; strongly acid; gradual wavy boundary.
BC—29 to 37 inches; red (2.5YR 4/6) sandy clay loam; weak fine subangular blocky structure; very friable; slightly sticky, slightly plastic; common pockets of sandy loam; few fine flakes of mica; strongly acid; gradual wavy boundary.
C—37 to 65 inches; saprolite consisting of strong brown (7.5YR 5/6), yellowish red (5YR 5/8), and red (2.5YR 4/8) fine sandy loam; massive; very friable; common fine and medium flakes of mica; 5 percent gravel, by volume; very strongly acid.

Range in Characteristics

Thickness of solum: 20 to 50 inches (fig. 19)
Depth to bedrock: Greater than 60 inches
Reaction: Strongly acid or very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Content and size of rock fragments: 0 to 15 percent, by volume, throughout the profile; dominantly gravel

Ap horizon:
Hue—2.5YR to 7.5YR
Value—3 to 5
Chroma—4 to 8
Texture—sandy clay loam

Bt horizon:
Hue—10R or 2.5YR
Value—4 or 5
Chroma—6 or 8
Mottles (if they occur)—few in shades of yellow or brown; occurring randomly
Texture—clay, clay loam, or sandy clay

BC horizon:
Hue—10R to 5YR
Value—4 or 5
Chroma—6 or 8
Mottles (if they occur)—few in shades of yellow or brown; occurring randomly
Texture—clay loam, sandy clay loam, or sandy loam

C horizon:
Color—similar to the BC horizon or multicolored
Texture—loamy saprolite

Rion Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape position: Piedmont uplands
Parent material: Residuum and material deposited by soil creep that weathered mainly from high-grade metamorphic rocks, such as biotite gneiss, porphyroblastic gneiss, and migmatitic gneiss
Slope range: 25 to 60 percent
Commonly associated soils: Pacolet, Bethlehem, Cliffside, and Ashlar soils on uplands
Taxonomic class: Fine-loamy, mixed, thermic Typic Hapludults

Typical Pedon

Rion sandy loam, 25 to 45 percent slopes; about 0.7 mile west of Sunny View on Secondary Road 1161, about 0.2 mile south on a logging road, 250 feet east of the road, in woodland:

A—0 to 4 inches; yellowish brown (10YR 5/4) sandy loam; weak fine granular structure; very friable; many fine and medium and few coarse roots; few fine flakes of mica; strongly acid; clear smooth boundary.

Bt1—4 to 10 inches; strong brown (7.5YR 4/6) sandy clay loam; weak fine subangular blocky structure; friable; slightly sticky, slightly plastic; few very faint clay films on faces of peds; common fine and medium roots; few fine flakes of mica; strongly acid; gradual wavy boundary.

Bt2—10 to 30 inches; yellowish red (5YR 5/8) clay loam; moderate medium subangular blocky structure; friable; slightly sticky, slightly plastic; few faint clay films on faces of peds; few fine and medium roots; few fine flakes of mica; strongly acid; gradual wavy boundary.

BC—30 to 38 inches; strong brown (7.5YR 5/8) sandy clay loam; common pockets of yellowish red (5YR 5/8) clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few fine and medium roots; few fine and medium flakes of mica; very strongly acid; gradual wavy boundary.

C—38 to 65 inches; saprolite consisting of strong brown (7.5YR 5/8) sandy loam; common coarse distinct yellowish red (5YR 5/8) mottles; massive; very friable; common fine flakes of mica; very strongly acid.

Range in Characteristics

Thickness of solum: 20 to 40 inches
Depth to bedrock: Greater than 60 inches
Reaction: Strongly acid or very strongly acid
Content and size of rock fragments: 0 to 15 percent, by volume, throughout the profile; dominantly gravel

A horizon:
Hue—5YR to 10YR
Value—4 to 6
Chroma—2 to 6
Texture—sandy loam

Bt horizon:
Hue—2.5YR to 7.5YR
Value—4 or 5
Chroma—4 to 8
Texture—sandy clay loam or clay loam

BC horizon:
Hue—2.5YR to 7.5YR
Value—4 to 6
Chroma—4 to 8
Mottles (if they occur)—few or common in shades of red, yellow, or brown
Texture—sandy clay loam, clay loam, loam, fine sandy loam, or sandy loam

C horizon:
Color—similar to the BC horizon or multicolored
Texture—saprolite consisting of variable textures ranging from sandy clay loam to loamy sand

Riverview Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape position: Piedmont flood plains
Parent material: Recent alluvium derived from mixed geologic sources
Slope range: 0 to 2 percent
Commonly associated soils: Chewacla, Buncombe, and Wehadkee soils on flood plains; Skyuka, Masada, Dogue, and Roanoke soils on stream terraces
Taxonomic class: Fine-loamy, mixed, thermic Fluventic Dystrochrepts

Typical Pedon

Riverview loam, 0 to 2 percent slopes, occasionally flooded; about 1.9 miles north of McGinnis Crossroads on Secondary Road 1004, about 1.7 miles northeast on Secondary Road 1302, about 800 feet east on a farm road, 20 feet south of the farm road, in cropland:

Ap—0 to 12 inches; dark brown (7.5YR 3/4) loam; moderate medium granular structure; very friable; many fine and few medium roots; few fine flakes of mica; moderately acid; clear smooth boundary.

Bw1—12 to 29 inches; dark yellowish brown (10YR 4/4) clay loam; weak medium subangular blocky structure; friable; few fine and medium roots; few fine flakes of mica; moderately acid; gradual wavy boundary.

Bw2—29 to 51 inches; dark yellowish brown (10YR 4/6) loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few fine flakes of mica; moderately acid; gradual wavy boundary.

Bw3—51 to 60 inches; dark yellowish brown (10YR 4/6) loam; common coarse distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; slightly sticky, slightly plastic; few fine flakes of mica; moderately acid.

Range in Characteristics

Thickness of solum: 24 to 60 inches
Depth to bedrock: Greater than 60 inches

Reaction: Moderately acid to very strongly acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Content of rock fragments: 0 percent, by volume, throughout the profile

Ap horizon:
Hue—7.5YR or 10YR
Value—3 or 5
Chroma—2 to 4
Texture—loam

Bw horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—4 to 8
Mottles—none to common in shades of yellow, brown, or red
Redoximorphic features—none to common iron depletions in shades of gray below a depth of 24 inches
Texture—clay loam, loam, sandy clay loam, silt loam, or silty clay loam

BC horizon (if it occurs):
Color—similar to the Bw horizon
Texture—sandy clay loam, loam, sandy loam, or fine sandy loam

C horizon (if it occurs):
Hue—7.5YR or 10YR
Value—4 to 8
Chroma—4 to 8
Mottles—none to common in shades of yellow, brown, or red
Redoximorphic features—none to common iron depletions in shades of gray
Texture—loam, fine sandy loam, sandy loam, loamy fine sand, loamy sand, or sand

Roanoke Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Slow
Landscape position: Piedmont stream terraces
Parent material: Old alluvium derived from mixed geologic sources
Slope range: 0 to 2 percent
Commonly associated soils: Skyuka, Masada, and Dogue soils on stream terraces; Chewacla, Riverview, and Wehadkee soils on adjacent flood plains; Cecil, Pacolet, and Appling soils on adjacent uplands
Taxonomic class: Clayey, mixed, thermic Typic Endoaquults

Typical Pedon

Roanoke loam in an area of Dogue-Roanoke complex, 0 to 6 percent slopes, rarely flooded; about 1.7 miles east of Columbus on Secondary Road 1137, about 1.9 miles east on Secondary Road 1521, about 1,020 feet south of the road, in a pasture:

Ap—0 to 5 inches; very dark gray (10YR 3/1) loam; moderate medium granular structure; friable; many fine and medium roots; few fine flakes of mica; slightly acid; clear smooth boundary.
BA—5 to 9 inches; dark gray (10YR 4/1) clay loam; moderate medium subangular blocky structure; friable; slightly sticky, slightly plastic; common fine and medium roots; few fine flakes of mica; slightly acid; clear smooth boundary.
Btg1—9 to 21 inches; gray (10YR 5/1) clay; moderate medium subangular blocky structure; firm; sticky, plastic; few fine prominent strong brown (7.5YR 5/6) iron accumulations; common distinct clay films on faces of peds; few fine and medium roots; few fine flakes of mica; very strongly acid; gradual wavy boundary.
Btg2—21 to 41 inches; gray (5Y 6/1) clay; moderate medium subangular blocky structure; firm; sticky, plastic; few distinct clay films on faces of peds; few fine flakes of mica; very strongly acid; clear smooth boundary.
Cg1—41 to 50 inches; very dark gray (10YR 3/1) loam; massive; friable; slightly sticky, slightly plastic; few fine flakes of mica; very strongly acid; abrupt smooth boundary.
Cg2—50 to 65 inches; gray (N 6/0) silty clay loam; massive; firm; sticky, plastic; few fine flakes of mica; very strongly acid.

Range in Characteristics

Thickness of solum: 40 to 60 inches
Depth to bedrock: Greater than 60 inches
Reaction: Strongly acid to extremely acid in unlimed areas; ranging to slightly acid in the upper part of the profile in limed areas
Content and size of rock fragments: 0 to 10 percent, by volume, in the A and B horizons and 0 to 50 percent in the C horizon; dominantly gravel

Ap horizon:
Hue—horizon is neutral in hue or has hue of 10YR or 5Y
Value—2 to 6
Chroma—0 or 2
Texture—loam

BA horizon:
Hue—horizon is neutral in hue or has hue of 10YR or 5Y
Value—4 to 7
Chroma—0 or 2
Texture—clay loam, loam, silt loam, or silty clay loam

Btg horizon:
Hue—horizon is neutral in hue or has hue of 10YR or 5Y
Value—4 to 7
Chroma—0 or 2
Redoximorphic features—few to many in shades of yellow, brown, or red
Texture—clay, clay loam, silty clay loam, or silty clay

BCg horizon (if it occurs):
Color—similar to the Btg horizon
Texture—sandy clay loam, clay loam, silty clay loam, or clay and strata of coarser textures

Cg horizon:
Color—variable
Texture—horizon is sandy to clayey in the fine-earth fraction or is stratified with these textures

Skyuka Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape position: Piedmont stream terraces
Parent material: Old alluvium derived from mixed geologic sources
Slope range: 2 to 8 percent
Commonly associated soils: Dogue and Roanoke soils on adjacent stream terraces; Riverview, Chewacla, and Buncombe soils on adjacent flood plains; Hiwassee soils on adjacent uplands and stream terraces
Taxonomic class: Fine, mixed, thermic Ultic Hapludalfs

Typical Pedon

Skyuka clay loam, 2 to 8 percent slopes, eroded; about 1.0 mile north of McGinnis Crossroads on Secondary Road 1004, about 1.5 miles northeast on Secondary Road 1359, about 0.2 mile east on Secondary Road 1004, about 1.5 miles north on Secondary Road 1356, about 300 feet northeast from the end of the road and 300 feet from the west side of the Green River, in cropland:

Ap—0 to 9 inches; dark brown (7.5YR 3/4) clay loam; moderate medium granular structure; friable; common faint clay films on faces of peds; common fine and medium roots; few fine flakes of mica; slightly acid; clear smooth boundary.

Bt1—9 to 30 inches; yellowish red (5YR 4/6) clay loam; moderate medium subangular blocky structure; firm; sticky, plastic; common faint clay films on faces of peds; common fine and medium roots; few fine flakes of mica; few medium, soft, irregular iron-manganese masses; slightly acid; gradual wavy boundary.

Bt2—30 to 38 inches; yellowish red (5YR 5/6) clay; few fine distinct strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; sticky, plastic; common faint clay films on faces of peds; few fine flakes of mica; few medium, soft, irregular iron-manganese masses; slightly acid; gradual wavy boundary.

Bt3—38 to 52 inches; yellowish red (5YR 5/8) clay loam; common medium distinct strong brown (7.5YR 5/8) and red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; firm; sticky, plastic; few faint clay films on faces of peds; common fine flakes of mica; common medium, soft, irregular iron-manganese masses; slightly acid; gradual wavy boundary.

BC—52 to 60 inches; strong brown (7.5YR 5/6) sandy clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; common medium distinct yellowish red (5YR 5/8) iron masses; common medium distinct yellowish brown (10YR 5/4) iron depletions; few fine flakes of mica; common medium, soft, irregular iron-manganese masses; slightly acid; gradual wavy boundary.

C—60 to 72 inches; multicolored brownish yellow (10YR 6/6), yellowish red (5YR 4/6), light brownish gray (2.5Y 6/2), and strong brown (7.5YR 4/6) fine sandy loam; massive; very friable; common fine flakes of mica; slightly acid.

Range in Characteristics

Thickness of solum: 48 to greater than 60 inches
Depth to bedrock: Greater than 60 inches
Reaction: Slightly acid to strongly acid in unlimed areas; ranging to neutral in the upper part of the profile in limed areas (fig. 20)
Content of rock fragments: 0 to 15 percent, by volume, throughout the profile

Ap horizon:
Hue—5YR or 10YR
Value—2 to 4
Chroma—2 to 4
Texture—clay loam

BA or AB horizon (if it occurs):
Hue—5YR to 10YR
Value—3 to 5
Chroma—4 to 6
Texture—loam, sandy clay loam, or clay loam

Bt horizon:
Hue—5YR to 10YR
Value—4 to 6
Chroma—4 to 8
Mottles—few to many in shades of red, yellow, or brown
Texture—clay loam, clay, or sandy clay

BC horizon:
Color—similar to the Bt horizon
Redoximorphic features (if they occur, below a depth of 48 inches) or mottles—few to many in shades of red, yellow, gray, or brown
Texture—sandy clay loam, clay loam, or loam

BCc horizon (if it occurs):
Color—similar to the BC horizon
Texture—similar to the BC horizon; including many hard iron-manganese concretions of gravel

C horizon:
Hue—7.5YR to 2.5Y
Value—4 to 7
Chroma—3 to 8
Redoximorphic features or mottles—few to many that occur in shades of red, yellow, gray, or brown or are multicolored
Texture—loam, fine sandy loam, sandy loam, clay loam, sandy clay loam, or silty clay loam; thin strata of loamy sand or sandy clay occurring in some pedons

Tate Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape position: Mountain coves and hill slopes
Parent material: Colluvium derived from mixed geologic sources
Slope range: 8 to 50 percent
Commonly associated soils: Greenlee soils in coves and on hill slopes; Ostin soils on adjacent flood plains; Evard, Cowee, Fannin, Ashe, and Cleveland soils on adjacent uplands
Taxonomic class: Fine-loamy, mixed, mesic Typic Hapludults

Typical Pedon

Tate cobbly sandy loam in an area of Tate-Greenlee complex, 15 to 30 percent slopes, extremely stony; about 2.5 miles northwest of Sunnyview on Secondary Road 1161, about 0.6 mile southwest on Secondary Road 1162, about 0.9 mile northwest on Secondary Road 1163, about 0.7 mile northwest on a private development road, 5 feet west of the road, in woodland:

A1—0 to 4 inches; brown (10YR 5/3) cobbly sandy loam; weak fine granular structure; very friable; many fine and medium and common coarse roots; 10 percent cobbles and 5 percent gravel, by volume; few fine flakes of mica; strongly acid; clear smooth boundary.
A2—4 to 10 inches; light yellowish brown (10YR 6/4) cobbly sandy loam; weak fine granular structure; very friable; many fine and medium and common coarse roots; 10 percent cobbles, 5 percent stones, and 5 percent gravel, by volume; few fine flakes of mica; very strongly acid; gradual smooth boundary.
Bt1—10 to 24 inches; yellowish brown (10YR 5/8) sandy clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few faint clay films on faces of peds; common fine and medium roots; 5 percent gravel and 5 percent cobbles, by volume; few fine flakes of mica; very strongly acid; gradual wavy boundary.
Bt2—24 to 46 inches; strong brown (7.5YR 5/6) sandy clay loam; moderate medium subangular blocky structure; friable; slightly sticky, slightly plastic; few faint clay films on faces of peds; few fine and medium roots; 5 percent gravel and 5 percent cobbles, by volume; few fine flakes of mica; very strongly acid; gradual wavy boundary.
BC—46 to 70 inches; strong brown (7.5YR 4/6) gravelly sandy loam; common pockets of loamy sand derived from weathered rock fragments; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few fine roots; 10 percent gravel, 5 percent cobbles, and 5 percent stones, by volume; few fine and medium flakes of mica; very strongly acid.

Range in Characteristics

Thickness of solum: 24 to greater than 60 inches
Depth to bedrock: Greater than 60 inches
Reaction: Strongly acid or very strongly acid
Content and size of rock fragments: 15 to 35 percent, by volume, in the A horizon and 5 to 35 percent in the lower horizons; ranging dominantly from gravel to stones (fig. 21)

A horizon:
Hue—10YR
Value—3 to 6
Chroma—2 to 4
Texture—cobbly sandy loam

BA horizon (if it occurs):
Hue—7.5YR to 10YR
Value—4 or 5

Chroma—3 to 6
Texture—sandy loam, sandy clay loam, loam, or clay loam in the fine-earth fraction

Bt horizon:
Hue—7.5YR to 2.5Y
Value—4 to 6
Chroma—4 to 8
Redoximorphic features (if they occur)—few in shades of gray below a depth of 24 inches
Texture—sandy clay loam, clay loam, or loam in the fine-earth fraction

BC horizon:
Color—similar to the Bt horizon
Texture—sandy clay loam, loam, fine sandy loam, or sandy loam in the fine-earth fraction

C horizon (if it occurs):
Color—variable
Texture—loamy or sandy; sandy textures occurring only below a depth of 40 inches

Udorthents

Depth class: Very deep to shallow
Drainage class: Somewhat excessively drained to somewhat poorly drained
Permeability: Very slow to moderately rapid
Landscape position: Areas where natural soils have been greatly altered by excavation or intensive grading or covered by earthy fill material
Slope range: 0 to 95 percent
Taxonomic class: Udorthents

Typical Pedon

Because of the variability of these soils, a typical pedon is not given. The excavated areas are mainly borrow pits from which the soil has been removed and used as foundation material for roads or buildings or as topsoil. The fill areas are sites where at least 20 inches of loamy, earthy fill material covers borrow pits, landfills, natural drainageways, or flood plains. Landfills have layers of nonsoil material covered with loamy soil material. Udorthents are in shades of red, brown, yellow, or gray. The texture is variable but typically loamy.

Range in Characteristics

Depth to bedrock: 10 to greater than 60 inches
Reaction: Slightly acid to extremely acid
Content and size of rock fragments: Variable; average of 0 to 35 percent, by volume, within a depth of 40 inches; ranging dominantly from gravel to stones

Wehadkee Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderate
Landscape position: Piedmont flood plains
Parent material: Recent alluvium derived from mixed geologic sources
Slope range: 0 to 2 percent
Commonly associated soils: Riverview, Buncombe, and Chewacla soils on flood plains; Skyuka, Masada, Dogue, and Roanoke soils on stream terraces
Taxonomic class: Fine-loamy, mixed, nonacid, thermic Typic Fluvaquents

Typical Pedon

Wehadkee loam, 0 to 2 percent slopes, frequently flooded; about 2.5 miles southeast of Columbus on Secondary Road 1137, about 0.3 mile west on Secondary Road 1516, about 50 feet south of the road, in woodland:

A1—0 to 9 inches; strong brown (7.5YR 5/6) and very dark gray (10YR 3/1) loam; weak medium granular structure; very friable; many fine and medium and few coarse roots; few fine flakes of mica; moderately acid; clear smooth boundary.
A2—9 to 13 inches; dark gray (10YR 4/1) loam; weak medium granular structure; very friable; many fine and medium and few coarse roots; common fine distinct dark brown (7.5YR 3/4) iron accumulations; few fine flakes of mica; moderately acid; clear smooth boundary.
Bg1—13 to 29 inches; dark gray (N 4/0) silt loam; weak medium subangular blocky structure; very friable; sticky, slightly plastic; few fine and medium roots; few fine prominent strong brown (7.5YR 4/6) iron accumulations; few fine flakes of mica; strongly acid; clear smooth boundary.
Bg2—29 to 54 inches; dark gray (5Y 4/1) silty clay loam; weak medium subangular blocky structure; firm; sticky, slightly plastic; few fine prominent dark yellowish brown (10YR 4/4) iron accumulations; few fine flakes of mica; moderately acid; clear smooth boundary.
Cg—54 to 74 inches; gray (10YR 5/1), stratified silty clay loam and loamy sand; massive; firm; sticky, slightly plastic; few fine prominent dark yellowish brown (10YR 4/6) iron accumulations; few fine flakes of mica; strongly acid.

Range in Characteristics

Thickness of solum: 20 to greater than 60 inches
Depth to bedrock: Greater than 60 inches

Reaction: Slightly acid to very strongly acid throughout the profile
Content and size of rock fragments: Less than 5 percent, by volume, above a depth of 40 inches and 0 to 35 percent below a depth of 40 inches; dominantly gravel

A horizon:
Hue—horizon is neutral in hue or has hue of 10YR or 2.5Y
Value—4 to 6
Chroma—0 to 4
Redoximorphic features—few or common in shades of brown
Texture—loam

Bg horizon:
Hue—horizon is neutral in hue or has hue of 10YR to 5Y
Value—4 to 6
Chroma—0 to 2
Redoximorphic features—few or common in shades of red, yellow, or brown
Texture—silt loam, silty clay loam, sandy clay loam, loam, or clay loam

Cg horizon:
Hue—horizon is neutral in hue or has hue of 10YR to 5Y
Value—4 to 7
Chroma—0 to 2
Redoximorphic features—few or common in shades of red, yellow, or brown
Texture—stratified with layers of silty clay loam, loamy sand, sandy clay loam, clay loam, sand, gravel, sandy loam, or loam

Formation of the Soils

This section describes the factors of soil formation and relates them to the soils in the survey area. More specific information on parent material and landscape position for individual soils can be found in the sections "Classification of the Soils" and "Detailed Soil Map Units." The soils in Polk County have been grouped according to parent material, landscape position, and important soil properties (figs. 22 and 23).

Factors of Soil Formation

Soils are formed by processes of the environment acting upon geologic materials, such as metamorphic, igneous, and sedimentary rocks, and fluvial stream sediments. The characteristics of a soil are determined by the combined influence of parent material, climate, plant and animal life, topography, and time. These five factors of soil formation are responsible for the profile development and chemical properties that differentiate soils *(4)*. Figure 24 illustrates variations in profile development caused by different combinations of soil-forming factors, such as parent material, topography, and time, in piedmont soils, and figure 25 illustrates these variations in mountain soils.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. The soils of Polk County formed in parent material that has either slowly accumulated from the weathering of consolidated bedrock or has been transported and deposited by water and gravity. Parent material is largely responsible for the chemical and mineralogical composition of soils and for the major differences among the soils of the county. Major differences in parent material, such as differences in texture, can be observed in the field. Less distinct differences, such as differences in mineralogical composition, can be determined only by careful laboratory analysis. The main parent materials of soils in Polk County are residuum, colluvium, and alluvium.

Residuum is unconsolidated mineral material that slowly accumulates on uplands. It originates as consolidated bedrock weathers and disintegrates in place. The kind and thickness of the accumulated residuum is partially related to the mineral composition of the consolidated bedrock and to its degree of resistance to weathering. Upland soils in Polk County formed mainly in residuum that weathered from high-grade metamorphic rocks, such as gneiss and schist.

Generally, schist bedrock resists weathering and thus limits the formation and accumulation of residuum. As a result, many of the soils that formed in schist residuum are moderately deep to bedrock and contain numerous rock fragments. The weathering of gneiss bedrock produces a thicker residual mass than the weathering of schist. Soils that formed in gneiss residuum typically are very deep to bedrock and contain few rock fragments.

Colluvium is soil material, rock fragments, or both, that have moved from the higher landforms and accumulated on the lower slopes. The combined forces of gravity and water are responsible for the transportation and deposition of colluvium. The transportation can occur slowly or by sudden, swift mass movements. In Polk County, most of the soils in mountain coves and on foot slopes formed in colluvium.

The larger mountain coves are the result of sudden, swift mass movements called debris avalanches. Drastic climatic changes in ancient periods may have contributed to these events. Debris avalanches produce extremely stony and bouldery colluvium. Smaller landscapes of coves and foot slopes are scattered throughout the mountains. The parent material in these areas contains fewer rock fragments and was deposited slowly by the process of soil creep. On uplands, soils that have steep and very steep slopes typically formed in a combination of residuum and colluvium influenced by soil creep.

Alluvium is soil material, rock fragments, or both, that have been deposited on land by moving water. Soils that formed in recent alluvium are on active flood plains adjacent to major creeks and rivers. Soils that formed in old alluvium occur on the higher stream terraces and some hill slopes, which are commonly adjacent to flood plains. The stream terraces are the remnants of ancient, higher-level flood plains, and most are no longer subject to the deposition of recent alluvium.

Soils that formed in recent alluvium can be coarse or fine textured, depending on their location on the flood plain. Coarse soils occur adjacent to the stream channel and at the upper reaches of flood plains, near the base of

CHART 1. Soil Series and Their Relationship Between Landscape Position, Parent Material, and Drainage Class

Texture and Parent Material	Excessively Drained	Well Drained	Moderately Well Drained	Somewhat Poorly Drained	Poorly Drained
Soils on Piedmont Flood Plains, Stream Terraces, and Foot Slopes					
Fine-loamy soils formed in recent alluvium		Riverview		Chewacla	Wehadkee
Sandy soils formed in recent alluvium	Buncombe				
Clayey soils formed in old alluvium		Masada Skyuka Hiwassee	Dogue		Roanoke
Soils on Mountain Flood Plains, Stream Terraces, Coves, and Foot Slopes					
Fine-loamy soils formed in recent alluvium				Arkaqua	
Sandy-skeletal soils formed in very gravelly and very cobbly recent alluvium		Ostin	Ostin		
Fine-loamy soils formed in old alluvium or colluvium		Brevard	Dillard		
Fine-loamy soils formed in stony and bouldery colluvium		Tate			
Loamy-skeletal soils formed in extremely stony and bouldery colluvium		Greenlee			

Figure 22.—Soil series and their relationship between landscape position, parent material, and drainage class.

the mountains. These soils do not have a high degree of profile development and are mainly sand or sand and gravel. Fine textured alluvium is deposited on the main part of the flood plain and in backwater areas adjacent to uplands. Soils that formed in fine textured alluvium have moderate profile development and predominantly loamy textures.

Soils on stream terraces and foot slopes that formed in old alluvium have a well developed profile and horizons. They have a loamy or clayey subsoil, depending on the geologic time period in which the alluvium was deposited. Soils that have a clayey subsoil formed in the most ancient alluvial deposits. Loamy soils formed in less ancient alluvium.

In Polk County, parent material is a major factor in determining what kind of soil forms and, to some degree, can be correlated to geologic formations *(12)*. The general soil map can serve as an approximate guide to the geology of the county.

The major components of the general soil map units in the survey area and the geologic material from which their parent material weathered are as follows:

The soils of the Pacolet-Madison-Rion general soil map unit formed in residuum weathered from high-grade metamorphic rocks, such as biotite gneiss, porphyroblastic gneiss, and migmatitic gneiss.

The soils of the Cecil-Pacolet general soil map unit formed in residuum weathered from high-grade metamorphic rock, such as biotite gneiss.

The soils of the Pacolet-Bethlehem-Rion general soil

CHART 2. Soil Series and Their Relationship Between Landscape Position, Parent Material, and Depth to Bedrock

Texture and Parent Material	Very Deep	Moderately Deep	Shallow
Soils on Piedmont Uplands			
Clayey soils formed in residuum	Appling Cecil Hiwassee Madison Pacolet	Bethlehem	
Fine-loamy soils formed in residuum and soil creep	Grover Rion		
Coarse-loamy soils formed in residuum and soil creep		Ashlar	
Loamy-skeletal soils formed in residuum and soil creep		Cliffside	
Soils on Mountain Uplands			
Clayey soils formed in residuum	Hayesville		
Fine-loamy soils formed in residuum and soil creep	Evard Fannin	Cowee	
Coarse-loamy soils formed in residuum and soil creep	Edneyville	Ashe Chestnut	Cleveland
Loamy-skeletal soils formed in residuum and soil creep		Cliffield	

Figure 23.—Soil series and their relationship between landscape position, parent material, and depth to bedrock.

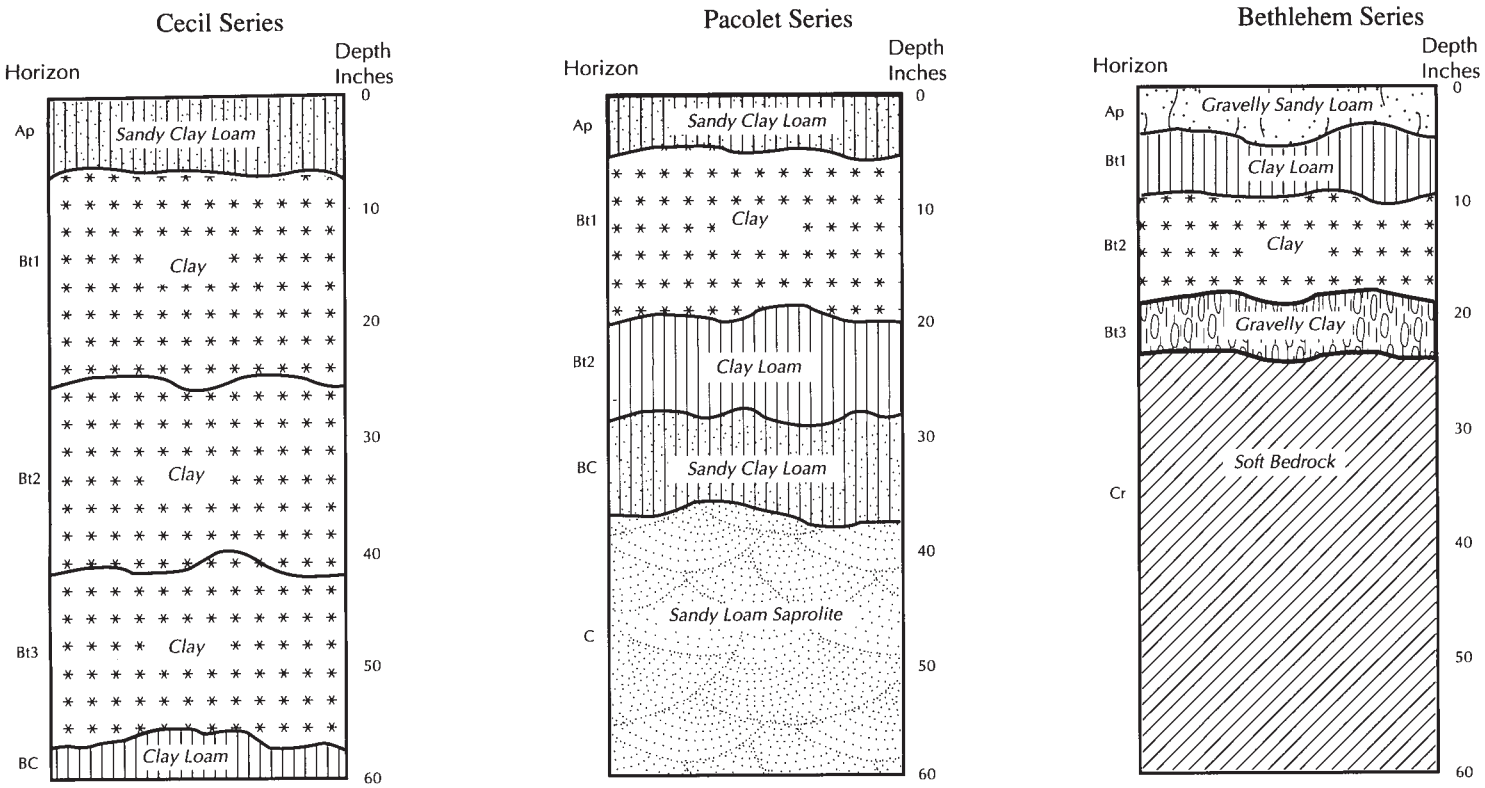

Figure 24.—Comparison between three piedmont upland soils showing depth and content of clay. Cecil soils are very deep to bedrock and have clayey textures that extend below a depth of 30 inches. Pacolet soils are very deep to bedrock and do not have clayey textures below a depth of 30 inches. Bethlehem soils are moderately deep to soft bedrock and, like Pacolet soils, do not have clayey textures below a depth of 30 inches.

map unit formed in residuum weathered from high-grade metamorphic rocks, such as biotite gneiss and sillimanite-mica schist.

The soils of the Riverview-Chewacla-Buncombe general soil map unit formed in recent alluvium derived from mixed geologic sources.

The soils of the Evard-Fannin-Cowee and Hayesville general soil map units formed in residuum weathered from high-grade metamorphic rocks, such as biotite gneiss and migmatitic gneiss.

The soils of the Cowee-Cliffield-Ashe-Cleveland general soil map unit formed in residuum weathered from high-grade metamorphic rocks, such as biotite gneiss, porphyroblastic gneiss, migmatitic gneiss, and sillimanite-mica schist.

The soils of the Tate-Greenlee general soil map unit formed in colluvium derived from mixed geologic sources.

Climate

Climate, particularly precipitation and temperature, affects the physical, chemical, and biological relationships in the soil. It influences the rate at which rocks weather and organic matter decomposes. The amount of leaching in a soil is related to the amount of rainfall and the movement of water through the soil. The effects of climate also control the kinds of plants and animals living in and on the soil. Temperature influences the kind and growth of organisms and the speed of chemical and physical reactions in the soil.

The climate of Polk County is warm and humid. Summers are long and hot, and winters are short and mild. Precipitation is distributed fairly evenly throughout the year. Local differences in climate are caused by variations in topography and elevation. Areas at the higher elevations on mountains are cooler and receive more rainfall than piedmont areas. Soils on steep, north-facing hill slopes receive less direct sunlight and generally are cooler and have more moisture than soils on the less sloping landscapes.

The effects of climate are reflected in the soils of Polk County. The present-day climate, which includes warm temperatures and ample rainfall, favors physical and chemical processes, such as leaching, eluviation, illuviation, and oxidation. Soils that formed in this climate are generally low in organic matter and soluble bases and have an increase in clay content below the surface layer.

Older climates were dramatically different than the

current one. They affected the formation of some soils in the survey area. For example, certain types of parent material, such as extremely thick colluvial or alluvial deposits, formed in a climate and under a vegetative cover much different from those of today. Also, some landforms in the survey area are very old. They include high stream terraces which were originally flood plains of ancient rivers that were larger than present-day rivers.

Plant and Animal Life

Plants and animals influence the formation and differentiation of soil horizons. The type and number of organisms in and on the soil are determined in part by climate and in part by the nature of the soil material, relief, and the age of the soil. Bacteria, fungi, and other micro-organisms aid in the weathering of rocks and in the decomposition of organic matter. The plants and animals that live on a soil are the primary source of organic material.

Plants largely determine the kinds and amounts of organic matter that are added to a soil under normal conditions and the way in which the organic matter is added. They also are important for the changes of base status and for the leaching process of a soil.

Animals convert complex compounds into simpler forms, add organic matter to the soil, and modify certain chemical and physical properties of the soil. In Polk County most of the organic material accumulates on the surface. It is acted upon by micro-organisms, fungi, earthworms, and other forms of life and by direct chemical reaction. It is mixed with the uppermost mineral part of the soil by the activities of earthworms and other small invertebrates. Rodents have had little effect on the formation of soils in the county.

Under the native forest of the survey area, not enough bases are brought to the surface by plants to counteract the effects of leaching. Generally, the soils of the county developed under a hardwood forest. Trees took up elements from the subsoil and added organic matter to the soil by depositing leaves, roots, twigs, and other plant remains on the surface. The material deposited on the surface was acted upon by organisms and underwent chemical reaction.

Organic material decomposes rapidly in the county because of the moderate temperatures, the abundant

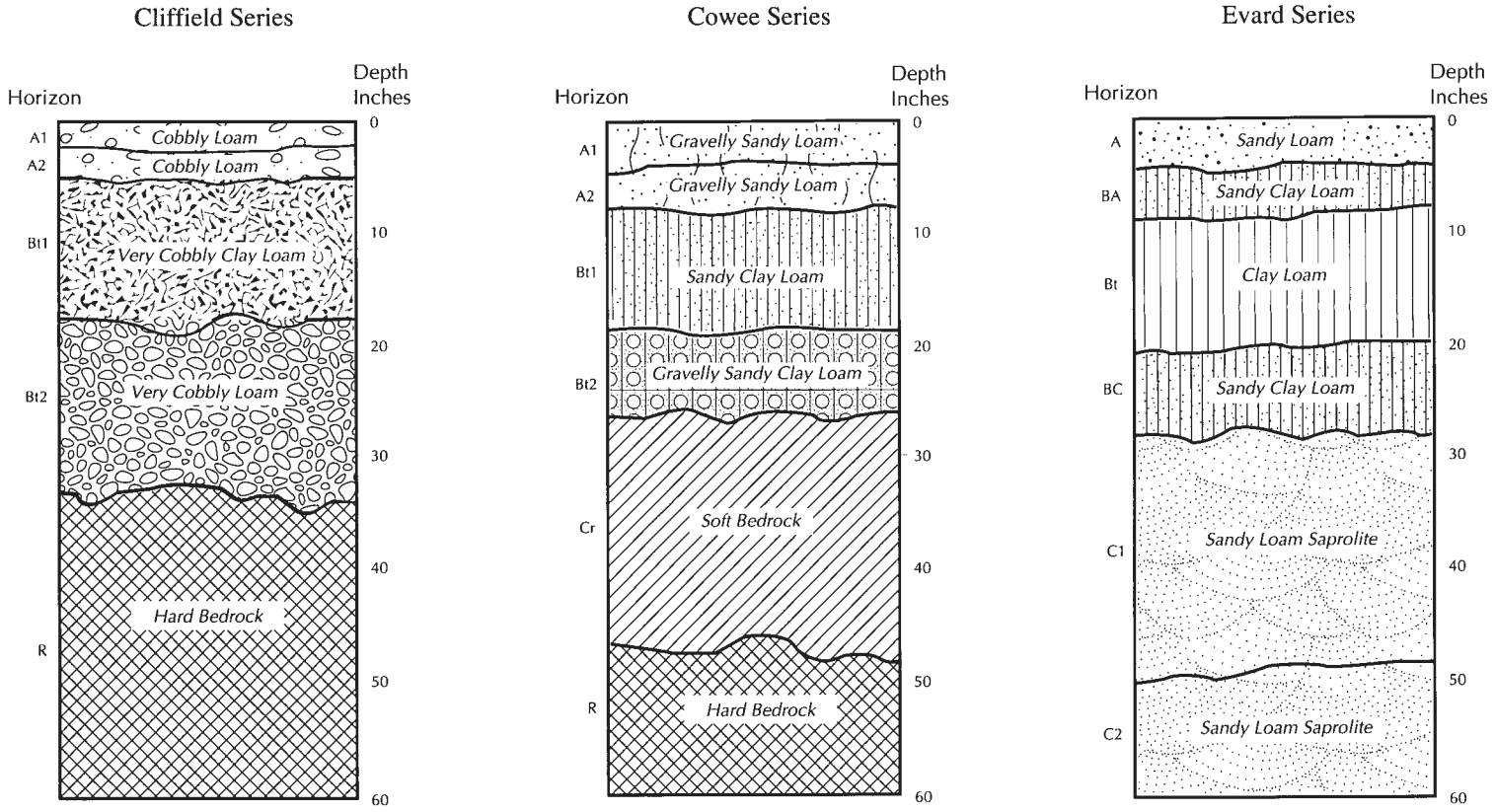

Figure 25.—Comparison between three mountain upland soils showing depth and content of rock fragments. Cliffield soils are moderately deep to hard bedrock and have an average of 35 percent rock fragments, by volume, in the subsoil. Cowee soils are moderately deep to soft bedrock. They have fewer rock fragments in the subsoil than the Cliffield soils. Evard soils are very deep to bedrock and have the least amount of rock fragments.

moisture supply, and the character of the organic material. It decays so rapidly that little of it accumulates in the soil.

Topography

The topography of Polk County is the result of a combination of geomorphic processes, including uplift, slope retreat, and the dissection of the original land surface by surface waters. The processes of slope retreat and dissection of the land surface are largely affected by the degree of resistance of bedrock to weathering and by past and present climatic conditions. Topography involves such features as slope, landscape position, elevation, and aspect. It influences soil formation by causing differences in subsurface drainage, surface water runoff, geologic erosion, and climate.

Landscape position and slope determine subsurface drainage. On uplands, soils on ridges and hill slopes are generally convex and well drained but some steep and very steep soils range to somewhat excessively drained. Soils on nearly level flood plains and stream terraces may have a higher water table. In concave areas, these soils are typically somewhat poorly drained or poorly drained. Soils on convex flood plains and stream terraces range from moderately well drained to excessively drained, depending on their specific landscape position. Subsurface soil drainage affects plant and animal activity; soil properties, such as organic matter content, color, and chemistry; and the rate at which chemical reactions take place in the soil.

As slope increases, the rates of surface water runoff and geologic erosion increase. Water and gravity transport soil material from the steeper landscapes to the less sloping landscapes, including coves and hill slopes. As a result, most soil profiles on the steeper landscapes are thinner than soil profiles in coves and on hill slopes.

Elevation and aspect affect soil formation through their relationship to climate and soil temperature. Chemical weathering and biological activity take place at a slower rate at the higher, cooler elevations on cooler aspects than at the lower elevations in piedmont areas. Because of the warmer temperatures and gentler slopes, many soils in the Piedmont have a deep, highly weathered, clayey subsoil.

Time

The length of time that soil material has been exposed to the soil-forming processes influences the degree of soil profile development. Generally, as soils age and profiles develop, the influence of parent material on the physical and chemical properties of a soil becomes less apparent. The soils in Polk County vary considerably in age and degree of profile development.

Old soils generally have a well developed profile and genetically related horizons. In Polk County, the oldest soils are on the less sloping uplands and stream terraces. Typically, these soils have a thick profile and clayey subsoil horizons. On the steeper uplands, geologic erosion removes soil material at a rate that limits the degree of profile development. Consequently, younger soils on steep and very steep slopes have a thinner profile and a less clayey subsoil and their properties show a greater influence of parent material.

The youngest soils in Polk County formed in recent alluvium that was deposited on flood plains. In these areas parent material is continually being added or removed by floods. Soils on flood plains commonly do not have a well developed profile and have many physical and chemical properties that are similar to those of their parent material.

Processes of Horizon Differentiation

One or more soil-forming processes are involved in the formation of soil horizons. These processes are the accumulation of organic matter; the leaching of carbonates and other soluble material; the chemical weathering, mainly by hydrolysis, of primary minerals into silicate clay minerals; the translocation of silicate clay and some silt-sized particles from one horizon to another; and the reduction and transfer of iron.

These processes have been active in the formation of most of the soils in Polk County. The interaction of the first four processes is indicated by the strongly expressed horizons in Masada soils. All five processes have probably been active in the formation of the moderately well drained Dogue soils.

Some organic matter has accumulated in all of the soils in the survey area. Most of the soils contain moderate amounts of organic matter in the surface layer. The content of organic matter ranges from low, as in Appling soils, to high, as in Wehadkee soils.

Most of the soils in the survey area are acid in the upper layers, unless the surface has been limed. Most of the soils formed in material that has a low content of bases, and most of the bases released by weathering have been leached out of the soil.

The translocation of clay minerals is an important process in the development of many soils in the survey area. As clay minerals are removed from the A horizon, they accumulate as clay films on the faces of peds, in pores, and in root channels in the B horizon.

As silicate clay forms from primary minerals, some iron is commonly released as hydrated oxides. These oxides are generally red. Even if they occur in small amounts, they give the soil material a brownish color. They are

largely responsible for the red to brown colors that dominate the subsoil of many soils in the survey area.

The reduction and transfer of iron have occurred in all of the soils that are not characterized by good natural drainage. This process, known as gleying, is evidenced by a gray matrix color and by iron or clay depletions. Some of the iron may be reoxidized and segregated, forming yellow, brown, red, or other brightly colored iron accumulations in an essentially gray matrix in the subsoil. Nodules or concretions of iron or manganese also commonly form as a result of this process. Soil features associated with chemically reduced iron are referred to as redoximorphic features *(24)*.

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Glossary

Access road. A road constructed to facilitate the use and management of the land. Access roads are designed for limited traffic and typically consist of a cut slope, a roadbed, and a fill outslope.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Aquifer. A water-bearing bed or stratum of permeable rock, sand, or gravel capable of fielding considerable quantities of water to wells or springs.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction which a slope faces. Generally, cool aspects are north- to east-facing and warm aspects are south- to west-facing.

Atterberg limits. Atterberg limits are measured for soil materials passing the No. 40 sieve. They include the liquid limit (LL), which is the moisture content at which the soil passes from a plastic to a liquid state, and the plasticity index (PI), which is the water content corresponding to an arbitrary limit between the plastic and semisolid states of consistency of a soil.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Biotite. A common rock-forming mineral consisting primarily of ferromagnesian silicate minerals. Color ranges from dark brown to green in thin section. Biotite is commonly referred to as "black mica" because of the natural black color.

Borrow pit. An open excavation from which the soil and underlying material have been removed, generally for use in road construction. Borrow pits support few or no plants without major reclamation. Areas identified on the detailed soil maps by a special symbol typically are less than 2 acres in size.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Broad-based dips. Short sections of access road having a reverse grade to intercept storm water and divert it off the roadbed. Dips are spaced about 200 feet apart and placed to divert water away from stream crossings or steep grades.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clayey. A general textural term that includes sandy clay, silty clay, and clay. According to family level criteria in the soil taxonomic system, a specific textural name referring to fine earth (particles less than 2 millimeters in size) containing 35 percent or more clay, by weight, within the control section. The content of rock fragments is less than 35 percent, by volume.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Clod. See Aggregate, soil.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse-loamy. According to family level criteria in the soil taxonomic system, soil containing less than 18 percent clay, by weight, and 15 percent or more fine sand or coarser material.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

Colluvial fan. A fan-shaped area of soils deposited by mass-wasting (direct gravitational action) and local unconcentrated runoff on and at the base of steeper hill slopes.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane that typically takes the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cove. The steep or very steep, concave colluvial area at

the head of drainageways in piedmont and mountainous areas. Areas of coves commonly have higher tree site indexes than surrounding slopes.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Crust. A thin, hard layer of soil material that forms on the surface in cultivated areas as the result of fine soil material settling out of ponding.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Dbh (diameter at breast height). The diameter of a tree at 4.5 feet above the ground level on the uphill side.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Delineation. The process of drawing or plotting features on a map with lines and symbols.

Depression (depressional area). A portion of land surrounded on all sides by higher land. These areas generally do not have outlets for drainage.

Depth class. Refers to the depth to a root-restricting layer. Unless otherwise stated, this layer is understood to be consolidated bedrock. The depth classes in this survey are:

Shallow	10 to 20 inches
Moderately deep	20 to 40 inches
Deep	40 to 60 inches
Very deep	more than 60 inches

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained.* These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. A narrow, gently sloping to very steep, concave colluvial area along an intermittent or perennial stream.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Engineering index test data. Laboratory test and mechanical analysis of selected soils in the county.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Eroded (soil phase). Because of erosion, these soils have lost an average of 25 to 75 percent of the original A horizon or the uppermost 2 to 6 inches if the original A horizon was less than 8 inches thick.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion classes. Classes based on estimates of past erosion. The classes are as follows:
Class 1.—Soils that have lost some of the original A

horizon but on the average less than 25 percent of the original A horizon or of the uppermost 8 inches (if the original A horizon was less than 8 inches thick). Throughout most of the area, the thickness of the surface layer is within the normal range of variability of the uneroded soil. Class 1 erosion typically is not designated in the name of the map unit or in the map symbol.

Class 2.—Soils that have lost an average of 25 to 75 percent of the original A horizon or of the uppermost 8 inches (if the original A horizon was less than 8 inches thick). Throughout most cultivated areas of class 2 erosion, the surface layer consists of a mixture of the original A horizon and material from below. Some areas may have intricate patterns ranging from uneroded spots to spots where all of the original A horizon has been removed.

Class 3.—Soils that have lost an average of 75 percent or more of the original A horizon or of the uppermost 8 inches (if the original A horizon was less than 8 inches thick). In most cultivated areas of class 3 erosion, material that was below the original A horizon is exposed. The plow layer consists entirely or largely of this material.

Class 4.—Soils that have lost all of the original A horizon or of the uppermost 8 inches (if the original A horizon was less than 8 inches thick) plus some or all of the deeper horizons throughout most of the area. The original soil can be identified only in spots. Some areas may be smooth, but most have an intricate pattern of gullies.

Erosion hazard. A term describing the potential for future erosion, inherent in the soil itself, in inadequately protected areas. The following definitions are based on estimated annual soil loss in metric tons per hectare (values determined by the Universal Soil Loss Equation assuming bare soil conditions and using rainfall and climate factors for North Carolina):

0 tons per hectare	none
Less than 2.5 tons per hectare	slight
2.5 to 10 tons per hectare	moderate
10 to 25 tons per hectare	severe
More than 25 tons per hectare	very severe

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Evapotranspiration. The combined loss of water from a given area through surface evaporation and through transpiration by plants during a specified period.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field border. A strip of perennial vegetation (trees, shrubs, or herbaceous plants) established on the edge of a field to control erosion, provide travel lanes for farm machinery, control competition from adjacent woodland, or provide food and cover for wildlife.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine-loamy. According to family level criteria in the soil taxonomic system, soil containing 18 to 35 percent, by weight, clay and 15 percent or more fine sand or coarser material.

Fine textured soil. Sandy clay, silty clay, or clay.

Flooding. The temporary covering of the soil surface by flowing water from any source, such as overflowing streams, runoff from adjacent or surrounding slopes, and inflow from high tides. The frequency of flooding generally is expressed as none, rare, occasional, or frequent. *None* means that flooding is not probable. *Rare* means that flooding is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year). *Occasional* means that flooding occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year). *Frequent* means that flooding occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). The duration of flooding is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 days to 1 month), and *very long* (more than 1 month).

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

General texture class. A broad textural grouping that describes the dominant fine-earth fraction (particles less than 2 millimeters in size) of the subsoil or layers beneath the surface layer to a depth of about 1 meter or to bedrock if the soil is less than 1 meter thick.

Clayey.—A general texture term that includes sandy clay, silty clay, and clay.

Loamy.—A general texture term that includes very coarse sandy loam, coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, sandy clay loam, and clay loam.

Sandy.—A general texture term that includes coarse sand, sand, fine sand, very fine sand, loamy coarse sand, loamy sand, loamy fine sand, and loamy very fine sand.

Silty.—A general texture term that includes silt, silt loam, and silty clay loam.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Gneiss. A coarse grained metamorphic rock in which bands rich in granular minerals alternate with bands that are predominantly schistose minerals.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Gravelly spot. An area where the content of rock fragments that are mostly less than 3 inches in diameter is more than 15 percent, by volume, in the surface layer, occurring in a map unit in which the surface layer of the dominant soil or soils has less than 15 percent gravel. Areas identified on the detailed soil maps by a special symbol typically are less than 2 acres in size.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A very small channel with steep sides cut by running water and through which water ordinarily runs only after rainfall, icemelt, or snowmelt. A gully generally is an obstacle to wheeled vehicles and is too deep to be obliterated by ordinary tillage. Areas identified on the detailed soil maps by a special symbol typically are less than 2 acres in size.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

High-grade metamorphic rocks. Highly metamorphosed rocks, such as gneiss and schist.

High stream terrace. A terrace, commonly 20 feet or higher in elevation than the adjacent flood plain, that is no longer subject to flooding.

High water table. The highest level of a saturated zone (the apparent or perched water table) over a continuous period of more than 2 weeks in most years, but not a permanent water table.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in

the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Hornblende. A rock-forming ferromagnesian silicate mineral of the amphibole group.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation include:

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Kaolinite. An aluminosilicate clay mineral with a 1:1 layer structure; that is, a silicon tetrahedral sheet alternating with an aluminum octahedral sheet. Little or no expansion occurs when water mixes with the clay.

Landfill. An area of accumulated waste products from human habitat. Landfill areas can be above or below the natural ground level. Areas identified on the detailed soil maps by a special symbol typically are less than 2 acres in size.

Landform. The description of a given terrain based on position and configuration. Examples are flood plain, stream terrace, fan, mountain slope, and ridge.

Landform position. A particular place within a landform. Examples are summit of a ridge, shoulder of a ridge, nose slope, side slope, back slope, and foot slope.

Landscape. A collection of related, natural landforms; generally, the land surface that can be seen in a single view.

Land shaping. The practice of scraping higher convex areas into lower concave areas in order to establish a nearly level field and reduce ponding.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Levees. Small dikes, generally less than 50 feet wide and several hundred feet in length, used to hold back water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy. A general textural term that includes coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, and silty clay loam. According to family level criteria in the soil taxonomic system, a specific textural name referring to fine earth (particles less than 2 millimeters in size) of loamy very fine sand or finer textured material that contains less than 35 percent clay, by weight, within the control section. The content of rock fragments is less than 35 percent, by volume.

Low stream terrace. A terrace in an area that floods, commonly 3 to 10 feet higher in elevation than the adjacent flood plain.

Low strength. The soil is not strong enough to support loads.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mean annual increment. The average yearly volume of a stand of trees from the year of origin to the age under consideration.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Micas. A group of silicate minerals characterized by sheet or scale cleavage. Biotite is the ferromagnesian black mica. Muscovite is the potassic white mica.

Microrelief. The concave to convex changes in the land surface occurring over a relatively short distance or within a small area, such as 1 acre.

Migmatite. A rock composed of igneous or igneous-appearing materials or metamorphic materials, or both.

Mine or quarry (map symbol). An open excavation from which the soil and underlying material have been removed, exposing bedrock; or the surface opening to underground mines. Areas identified on the detailed soil maps by a special symbol typically are less than 2 acres in size.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Muscovite. A nonferromagnesian rock-forming silicate mineral that has tetrahedra arranged in sheets. Commonly called "white mica" and sometimes called potassic mica.

Native pasture. Pasture that has seeded naturally in native grasses. It is on slopes too steep to manage with modern machinery.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

No-till planting. A method of planting crops in which there is virtually no seedbed preparation. A thin slice of the soil is opened, and the seed is planted at the desired depth.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Low	0.5 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Perennial water. An area that generally provides water for human or livestock consumption; commonly a lake, pond, river, or stream. Areas identified on the detailed soil maps by a special symbol typically are less than 2 acres in size.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piedmont. The physiographic region of central North Carolina characterized by rolling landscapes formed from the weathering of residual rock material.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pits, quarry (mine or quarry). A small borrow area or pit (commonly less than 5 acres in size) where soil, gravel, or stone has been removed.

Plant competition. In woodland management, the likelihood of invasion or growth of undesirable species when openings are made in the canopy.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Porphyroblast. A large crystal that developed in metamorphic rock through recrystallization.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Potential productivity. Relative terms assigned to classes to indicate the potential of a soil for agricultural use compared with that of other soils in the survey area. The same soil in a different survey area may have a different rating for a given use. In this survey area six classes are used for comparative ratings of soil potential. They are as follows:

Very high.—Productivity is well above local standards because soil conditions are exceptionally favorable and management costs are low in relation to the expected yields.

High.—Productivity is above local standards; soil conditions are favorable and management costs are relatively low in relation to the expected yields.

Moderately high.—Productivity is at or slightly above local standards; soil conditions are generally favorable and management costs are moderate in relation to the expected yields.

Moderate.—Productivity is at or slightly below local standards; soil conditions are marginal and management costs are usually high in relation to the expected yields.
Low.—Productivity is significantly below local standards; soil conditions are generally unfavorable and management costs are usually very high in relation to the expected yields.
Very low.—Productivity is much below local standards; soil conditions are unfavorable and management costs usually exceed economic returns.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Ridge. A long, narrow elevation of the land surface, usually having a sharp crest and steep sides.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Rippable bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 drawbar horsepower rating.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop. An area of exposed bedrock in a map unit that has less than 0.1 percent exposed bedrock. Areas identified on the detailed soil maps by a special symbol typically are less than 2 acres in size.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Rotational grazing. Moving livestock from one grazing area to another in order to maintain optimum forage height and pasture productivity.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Runoff class (surface). Refers to the rate at which water flows away from the soil over the surface without infiltrating. Six classes of rate of runoff are recognized:
Ponded.—Little of the precipitation and water that runs onto the soil escapes as runoff, and free water stands on the surface for significant periods. The amount of water that is removed from ponded areas by movement through the soil, by plants, or by evaporation is usually greater than the total rainfall. Ponding normally occurs on level and nearly level soils in depressions. The water depth may fluctuate greatly.
Very slow.—Surface water flows away slowly, and free water stands on the surface for long periods or

immediately enters the soil. Most of the water passes through the soil, is used by plants, or evaporates. The soils are commonly level or nearly level or are very porous.

Slow.—Surface water flows away so slowly that free water stands on the surface for moderate periods or enters the soil rapidly. Most of the water passes through the soil, is used by plants, or evaporates. The soils are nearly level or very gently sloping, or they are steeper but absorb precipitation very rapidly.

Medium.—Surface water flows away so rapidly that free water stands on the surface for only short periods. Part of the precipitation enters the soil and is used by plants, is lost by evaporation, or moves into underground channels. The soils are nearly level or gently sloping and absorb precipitation at a moderate rate, or they are steeper but absorb water rapidly.

Rapid.—Surface water flows away so rapidly that the period of concentration is brief and free water does not stand on the surface. Only a small part of the water enters the soil. The soils are mainly moderately steep or steep and have moderate or slow rates of absorption.

Very rapid.—Surface water flows away so rapidly that the period of concentration is very brief and free water does not stand on the surface. Only a small part of the water enters the soil. The soils are mainly steep or very steep and absorb precipitation slowly.

Sand. As a soil separate, individual rock or mineral fragments ranging from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy. A general textural term that includes coarse sand, sand, fine sand, very fine sand, loamy coarse sand, loamy sand, loamy fine sand, and loamy very fine sand. According to family level criteria in the soil taxonomic system, a specific textural name referring to fine earth (particles less than 2 millimeters in size) of sand or loamy sand that contains less than 50 percent very fine sand, by weight, within the control section. The content of rock fragments is less than 35 percent, by volume.

Sandy spot. An area where the surface layer is sandy (loamy sand or sand) in a map unit in which the dominant soil or soils have a loamy, silty, or clayey surface layer. Excluded are areas where the textural classes are adjoining, such as an area of loamy sand in a map unit in which the dominant soil or soils have a surface layer of sandy loam. Areas identified on the detailed soil maps by a special symbol typically are less than 2 acres in size.

Saprolite. Unconsolidated residual material underlying the genetically developed soil and grading to bedrock below.

Saprolite instability. A property of highly micaceous saprolite that makes it very susceptible to piping, erosion, and slumping and unable to support loads.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Schist. A metamorphic rock dominated by fibrous or platy minerals. It has schistose cleavage and is a product of regional metamorphism.

Sedimentation. The deposit or accumulation of sediment consisting of soil material, nutrients, and chemicals transported by surface water.

Seep. A small area on the landscape where water oozing through the soil causes the surface to remain wet, but water does not flow on the surface.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Severely eroded spot. An area of soil that has lost an average of 75 percent or more of the original surface layer because of accelerated erosion in a map unit in which the dominant soil or soils have lost less than 25 percent of the original surface layer. Areas identified on the detailed soil maps by a special symbol typically are less than 2 acres in size.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Short, steep slope. An area where the soil is at least two slope classes steeper than the surrounding named map unit. Areas identified on the detailed soil maps by a special symbol typically are long, narrow bands that are less than 2 acres in size. (See Slope.)

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. The landscape position that is just below the shoulder and just above the toe slope, occupying most of the mountainside or hillside.

Sillimanite. An orthorhombic mineral that occurs in long, slender crystals, commonly as fibrous aggregates in schists.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Skidding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most systems involve pulling the trees with wire cables attached to a bulldozer or rubber-tired tractor. Generally, felled trees are skidded or pulled with one end lifted to reduce friction and soil disturbance.

Skid trails. The paths left from skidding logs and the bulldozer or tractor used to pull them.

Slide or slip. A prominent landform scar or ridge caused by fairly recent mass movement (descent of earthy material resulting from failure of earth or rock under shear stress) along one or several surfaces. Areas identified on the detailed soil maps by a special symbol typically are less than 15 acres in size.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 3 percent
Gently sloping	2 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 30 percent
Steep	25 to 60 percent
Very steep	45 percent and higher

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil compaction. An alteration of soil structure that ultimately can affect the biological and chemical properties of the soil. Compaction decreases the extent of voids and increases bulk density.

Soil creep. The slow mass movement of soil and soil materials downslope, primarily under the influence of gravity, facilitated by water saturation and by alternating freezing and thawing.

Soil map unit. A kind of soil or miscellaneous area or a combination of two or more soils or one or more soils and one or more miscellaneous areas that can be shown at the scale of mapping for the defined purposes and objectives of the soil survey. They are generally designed to reflect significant differences in use and management.

Soil sample site (map symbol). The location of a typifying pedon in the survey area.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Soil strength. The load-supporting capacity of a soil at specific moisture and density conditions.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Specialty crop. Crops, such as Fraser fir grown for use as Christmas trees, that require intensive management and a specific combination of soils and climate.

Spring. A small area on the landscape where water flows naturally through the soil and onto the surface.

Stones. Rock fragments 10 to 24 inches (25 to 60

centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stony spot. An area where 0.01 to 0.1 percent of the surface is covered by rock fragments that are more than about 10 inches in diameter. Areas identified on the detailed soil maps by a special symbol typically are less than 2 acres in size.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Suitability ratings. Ratings for the degree of suitability of soils for pasture, crops, woodland, and engineering uses. The ratings and the general criteria used for their selection are as follows:

Well suited.—The intended use may be initiated and maintained by using only the standard materials and methods typically required for that use. Good results can be expected.

Moderately suited.—The limitations affecting the intended use make special planning, design, or maintenance necessary.

Poorly suited.—The intended use is difficult or costly to initiate and maintain because of certain soil properties, such as steep slopes, a severe hazard of erosion, a high water table, low fertility, and a hazard of flooding. Major soil reclamation, special design, or intensive management practices are needed.

Unsuited.—The intended use is very difficult or costly to initiate and maintain, and thus it generally should not be undertaken.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine." The textural classes are defined as follows:

Sands (coarse sand, sand, fine sand, and very fine sand).—Soil material in which the content of sand is 85 percent or more and the percentage of silt plus 1½ times the percentage of clay does not exceed 15.

Loamy sands (loamy coarse sand, loamy sand, loamy fine sand, and loamy very fine sand).—Soil material in which, at the upper limit, the content of sand is 85 to 90 percent and the percentage of silt plus 1½ times the percentage of clay is not less than 15; at the lower limit, the content of sand is 70 to 85 percent and the percentage of silt plus twice the percentage of clay does not exceed 30.

Sandy loams (coarse sandy loam, sandy loam, fine sandy loam, and very fine sandy loam).—Soil material in which the content of clay is 20 percent or less, the percentage of silt plus twice the percentage of clay exceeds 30, and the content of sand is 52 percent or more or soil material in which the content of clay is less than 7 percent, the content of silt is less than 50 percent, and the content of sand is 43 to 52 percent.

Loam.—Soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand.

Silt loam.—Soil material that contains 50 percent or more silt and 12 to 27 percent clay or 50 to 80 percent silt and less than 12 percent clay.

Silt.—Soil material that contains 80 percent or more silt and less than 12 percent clay.

Sandy clay loam.—Soil material that contains 20 to 35 percent clay, less than 28 percent silt, and 45 percent or more sand.

Clay loam.—Soil material that contains 27 to 40 percent clay and 20 to 45 percent sand.

Silty clay loam.—Soil material that contains 27 to 40 percent clay and less than 20 percent sand.

Sandy clay.—Soil material that contains 35 percent or more clay and 45 percent or more sand.

Silty clay.—Soil material that contains 40 percent or more clay and 40 percent or more silt.

Clay.—Soil material that contains 40 percent or more

clay, less than 45 percent sand, and less than 40 percent silt.

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topography. The relative positions and elevations of the natural or manmade features of an area that describe the configuration of its surface.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Underlying material. Technically the C horizon; the part of the soil below the biologically altered A and B horizons.

Understory. The trees and other woody species growing under a more or less continuous cover of branches and foliage formed collectively by the upper portions of adjacent trees and other woody growth.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Very bouldery spot. An area where 0.1 to 3 percent of the surface is covered by rock fragments that are more than 24 inches in diameter. Areas identified on the detailed soil maps by a special symbol typically are less than 2 acres in size.

Very stony spot. An area where 0.1 to 3 percent of the surface is covered by rock fragments that are more than about 10 inches in diameter. Areas identified on the detailed soil maps by a special symbol typically are less than 2 acres in size.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Water table (apparent). A thick zone of free water in the soil. The apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table (perched). A saturated zone of water in the soil standing above an unsaturated zone.

Water table (seasonal high). The highest level of a saturated zone in the soil (the apparent or perched water table) over a continuous period of more than 2 weeks in most years, but not a permanent water table.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Wetness. A general term applied to soils that hold water at or near the surface long enough to be a common management problem.

Wet spot. An area of somewhat poorly drained to very poorly drained soils that are at least two drainage classes wetter than the named soils in the surrounding map unit. Areas identified on the detailed soil maps by a special symbol typically are less than 2 acres in size. (See Drainage class.)

Windthrow. The uprooting and tipping over of trees by the wind.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1948-93 at Tryon, North Carolina)

Month	Temperature						Precipitation			
				2 years in 10 will have--				2 years in 10 will have--		
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more
	°F	°F	°F	°F	°F	Units	In	In	In	
January	53.2	31.2	42.2	75	5	147	5.04	2.91	6.94	7
February	57.2	32.8	45.0	77	12	179	5.56	2.61	8.11	7
March	65.1	38.9	52.0	84	20	372	6.65	3.95	9.06	8
April	74.2	46.3	60.3	91	29	594	5.07	2.54	7.27	6
May	80.8	54.8	67.8	93	36	843	5.61	2.87	8.00	8
June	86.2	61.9	74.0	98	47	980	5.50	2.96	7.74	7
July	88.6	66.1	77.3	98	54	1,117	5.42	3.11	7.47	8
August	87.5	65.0	76.3	98	53	1,118	6.03	2.58	8.96	7
September	81.7	59.2	70.5	95	42	914	5.07	1.53	7.95	6
October	73.4	48.1	60.8	88	29	644	4.90	1.64	7.57	5
November	63.7	39.5	51.6	82	19	348	4.61	2.34	6.59	6
December	54.9	32.7	43.8	74	11	168	5.08	2.52	7.30	6
Yearly:										
Average	72.2	48.0	60.1	---	---	---	---	---	---	---
Extreme	105	-8	---	100	3	---	---	---	---	---
Total	---	---	---	---	---	7,423	64.54	52.69	73.71	81

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1948-93 at Tryon, North Carolina)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Mar. 24	Apr. 6	Apr. 24
2 years in 10 later than--	Mar. 16	Mar. 31	Apr. 18
5 years in 10 later than--	Mar. 1	Mar. 19	Apr. 5
First freezing temperature in fall:			
1 year in 10 earlier than--	Nov. 12	Oct. 24	Oct. 15
2 years in 10 earlier than--	Nov. 16	Oct. 30	Oct. 20
5 years in 10 earlier than--	Nov. 25	Nov. 11	Oct. 30

TABLE 3.--GROWING SEASON

(Recorded in the period 1948-93 at Tryon, North Carolina)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	228	206	182
8 years in 10	237	215	190
5 years in 10	254	231	205
2 years in 10	271	247	221
1 year in 10	279	255	229

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
ApB	Appling sandy loam, 2 to 6 percent slopes	320	0.2
ArA	Arkaqua loam, 0 to 2 percent slopes, occasionally flooded	349	0.2
AsF	Ashe-Cleveland-Rock outcrop complex, 50 to 95 percent slopes	3,522	2.3
BrC	Brevard sandy loam, 8 to 15 percent slopes	356	0.2
BuB	Buncombe loamy sand, 0 to 5 percent slopes, occasionally flooded	1,420	0.9
CeB2	Cecil sandy clay loam, 2 to 8 percent slopes, eroded	13,466	8.8
ChA	Chewacla loam, 0 to 2 percent slopes, occasionally flooded	2,831	1.9
CxD	Cliffield-Cowee complex, 15 to 30 percent slopes, very stony	3,216	2.1
DdB	Dillard sandy loam, 1 to 6 percent slopes, rarely flooded	231	0.2
DoB	Dogue-Roanoke complex, 0 to 6 percent slopes, rarely flooded	3,206	2.1
EdF	Edneyville-Chestnut complex, 50 to 95 percent slopes, stony	1,958	1.3
EvD	Evard-Cowee complex, 15 to 30 percent slopes, stony	3,239	2.1
EvE	Evard-Cowee complex, 30 to 50 percent slopes, stony	10,703	7.0
EvF	Evard-Cowee complex, 50 to 85 percent slopes, stony	2,030	1.3
FcD	Fannin-Cowee complex, 15 to 30 percent slopes, stony	2,698	1.8
FcE	Fannin-Cowee complex, 30 to 50 percent slopes, stony	7,819	5.1
FcF	Fannin-Cowee complex, 50 to 85 percent slopes, stony	1,562	1.0
GrE	Grover loam, 25 to 45 percent slopes	6,229	4.1
HaC	Hayesville fine sandy loam, 8 to 15 percent slopes	899	0.6
HaD	Hayesville fine sandy loam, 15 to 30 percent slopes	2,119	1.4
HwB2	Hiwassee clay loam, 2 to 8 percent slopes, eroded	779	0.5
HwC2	Hiwassee clay loam, 8 to 15 percent slopes, eroded	1,218	0.8
MaC2	Madison sandy clay loam, 8 to 15 percent slopes, eroded	8,599	5.6
MaD2	Madison sandy clay loam, 15 to 25 percent slopes, eroded	8,785	5.7
MsB	Masada sandy loam, 2 to 8 percent slopes	1,031	0.7
OsA	Ostin loamy sand, 1 to 3 percent slopes, occasionally flooded	702	0.5
PaC2	Pacolet sandy clay loam, 8 to 15 percent slopes, eroded	18,752	12.3
PaD2	Pacolet sandy clay loam, 15 to 25 percent slopes, eroded	9,933	6.5
PbC2	Pacolet-Bethlehem complex, 8 to 15 percent slopes, eroded	6,332	4.1
PbD2	Pacolet-Bethlehem complex, 15 to 25 percent slopes, eroded	3,484	2.3
Pt	Pits, quarries	22	*
RnE	Rion sandy loam, 25 to 45 percent slopes	11,559	7.6
RoF	Rion-Ashlar-Rock outcrop complex, 45 to 70 percent slopes	1,624	1.1
RtE	Rion-Cliffside complex, 25 to 45 percent slopes, very stony	2,521	1.6
RvA	Riverview loam, 0 to 2 percent slopes, occasionally flooded	1,749	1.1
SkB2	Skyuka clay loam, 2 to 8 percent slopes, eroded	654	0.4
TaC	Tate-Greenlee complex, 8 to 15 percent slopes, extremely stony	989	0.6
TaD	Tate-Greenlee complex, 15 to 30 percent slopes, extremely stony	2,114	1.4
TgE	Tate-Greenlee complex, 30 to 60 percent slopes, extremely bouldery	1,975	1.3
Ud	Udorthents, loamy	850	0.6
UoB	Udorthents, loamy, 0 to 5 percent slopes, rarely flooded	161	0.1
WeA	Wehadkee loam, 0 to 2 percent slopes, frequently flooded	249	0.2
	Water	673	0.4
	Total	152,928	100.0

* Less than 0.1 percent.

TABLE 5.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Soybeans	Wheat	Tomatoes	Alfalfa hay	Grass-legume hay	Pasture
		Bu	Bu	Bu	Tons	Tons	Tons	AUM*
ApB--Appling	IIe	90	35	50	---	3.0	4.5	7.5
ArA--Arkaqua	IIIw	110	40	---	17	---	5.0	8.3
AsF**:								
Ashe	VIIs	---	---	---	---	---	---	---
Cleveland	VIIe	---	---	---	---	---	---	---
Rock outcrop	VIIIs	---	---	---	---	---	---	---
BrC--Brevard	IVe	90	35	50	---	3.0	3.6	6.0
BuB--Buncombe	IVw	---	---	---	---	---	---	3.0
CeB2--Cecil	IIIe	80	30	45	---	2.9	3.2	5.3
ChA--Chewacla	IIIw	110	40	---	17	---	5.0	8.3
CxD:								
Cliffield	VIs	---	---	---	---	---	---	---
Cowee	VIe	---	---	---	---	---	---	---
DdB--Dillard	IIw	115	40	55	20	---	5.0	8.3
DoB:								
Dogue	IIe	115	40	55	20	---	4.8	8.0
Roanoke	IVw	---	---	---	---	---	2.0	3.3
EdF--Edneyville-Chestnut	VIIe	---	---	---	---	---	---	---
EvD:								
Evard	VIe	---	---	---	---	---	---	4.5
Cowee	VIe	---	---	---	---	---	---	4.0
EvE, EvF--Evard-Cowee	VIIe	---	---	---	---	---	---	---
FcD:								
Fannin	VIIe	---	---	---	---	---	---	4.5
Cowee	VIe	---	---	---	---	---	---	4.0

See footnotes at end of table.

TABLE 5.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Wheat	Tomatoes	Alfalfa hay	Grass-legume hay	Pasture
		Bu	Bu	Bu	Tons	Tons	Tons	AUM*
FcE, FcF--------- Fannin-Cowee	VIIe	---	---	---	---	---	---	---
GrE-------------- Grover	VIIe	---	---	---	---	---	---	---
HaC-------------- Hayesville	IVe	80	25	40	---	2.8	3.2	5.0
HaD-------------- Hayesville	VIe	---	---	---	---	---	---	4.5
HwB2------------- Hiwassee	IIIe	85	30	45	---	2.9	3.4	5.7
HwC2------------- Hiwassee	IVe	65	25	35	---	2.6	3.2	5.0
MaC2------------- Madison	IVe	65	25	35	---	2.6	3.0	4.6
MaD2------------- Madison	VIe	---	---	---	---	---	---	4.0
MsB-------------- Masada	IIe	90	35	50	19	3.0	4.5	7.5
OsA-------------- Ostin	IIIs	---	---	---	---	---	2.5	4.0
PaC2------------- Pacolet	IVe	65	25	35	---	2.6	3.0	4.6
PaD2------------- Pacolet	VIe	---	---	---	---	---	---	4.0
PbC2: Pacolet--------- Bethlehem------	IVe IVe	65 55	25 20	35 25	--- ---	2.6 2.0	3.0 2.5	4.6 3.8
PbD2: Pacolet--------- Bethlehem------	VIe VIe	--- ---	--- ---	--- ---	--- ---	--- ---	--- ---	4.0 3.6
Pt**------------- Pits, quarries	VIIIs	---	---	---	---	---	---	---
RnE-------------- Rion	VIIe	---	---	---	---	---	---	---
RoF**: Rion----------- Ashlar--------- Rock outcrop---	VIIe VIIe VIIIs	--- --- ---	--- --- ---	--- --- ---	--- --- ---	--- --- ---	--- --- ---	--- --- ---

See footnotes at end of table.

TABLE 5.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Wheat	Tomatoes	Alfalfa hay	Grass-legume hay	Pasture
		Bu	Bu	Bu	Tons	Tons	Tons	AUM*
RtE:								
Rion	VIIe	---	---	---	---	---	---	---
Cliffside	VIIs	---	---	---	---	---	---	3.0
RvA	IIw	125	50	60	25	---	6.0	10.0
Riverview								
SkB2	IIIe	100	35	55	19	3.2	4.5	7.5
Skyuka								
TaC:								
Tate	IVs	---	---	---	---	---	---	---
Greenlee	VIIs	---	---	---	---	---	---	---
TaD:								
Tate	VIs	---	---	---	---	---	---	---
Greenlee	VIIs	---	---	---	---	---	---	---
TgE	VIIs	---	---	---	---	---	---	---
Tate-Greenlee								
Ud, UoB	VIIs	---	---	---	---	---	---	---
Udorthents								
WeA	VIw	---	---	---	---	---	---	---
Wehadkee								

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol[1]	Management concerns				Potential productivity			Trees to plant[4]
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index[2]	Volume[3]	
ApB---------- Appling	8A	Slight	Slight	Slight	Slight	Loblolly pine-------	84	118	Loblolly pine, shortleaf pine, yellow-poplar.
						Shortleaf pine------	63	95	
						Virginia pine-------	77	118	
						Black oak-----------	74	56	
						White oak-----------	64	47	
						Yellow-poplar-------	81	73	
						Sweetgum------------	---	---	
						Southern red oak----	---	---	
						Hickory-------------	---	---	
ArA---------- Arkaqua	8W	Slight	Moderate	Moderate	Slight	Yellow-poplar-------	100	107	Eastern white pine, shortleaf pine, Virginia pine, black walnut, yellow-poplar, northern red oak.
						Eastern white pine--	90	166	
						Shortleaf pine------	75	120	
						Virginia pine-------	80	122	
AsF[5]:									
Ashe----------	3R	Severe	Severe	Moderate	Moderate	Chestnut oak--------	57	40	Eastern white pine, shortleaf pine, black locust.
						Eastern white pine--	80	144	
						Shortleaf pine------	57	82	
						Virginia pine-------	62	95	
						Pitch pine----------	---	---	
						Scarlet oak---------	---	---	
						Northern red oak----	---	---	
Cleveland------	2R	Severe	Severe	Moderate	Severe	Chestnut oak--------	45	30	Eastern white pine, Virginia pine, black locust.
						Northern red oak----	60	43	
						Eastern white pine--	70	121	
						Hickory-------------	---	---	
						Virginia pine-------	57	84	
						Pitch pine----------	---	---	
						Scarlet oak---------	---	---	
						Red cedar-----------	---	---	
Rock outcrop.									
BrC---------- Brevard	11A	Slight	Slight	Slight	Slight	Eastern white pine--	86	157	Eastern white pine, shortleaf pine, yellow-poplar, black locust.
						Virginia pine-------	77	118	
						Shortleaf pine------	69	108	
						Northern red oak----	75	57	
						Yellow-poplar-------	---	---	
						Hemlock-------------	---	---	
						White oak-----------	---	---	
						Red maple-----------	---	---	

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol[1]	Management concerns				Potential productivity			Trees to plant[4]
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index[2]	Volume[3]	
BuB---------- Buncombe	8S	Slight	Moderate	Moderate	Slight	Yellow-poplar--------- Loblolly pine--------- American sycamore----- Sweetgum------------- Southern red oak----- Hickory-------------- Elm------------------ River birch----------	100 90 --- --- --- --- --- ---	107 131 --- --- --- --- --- ---	Loblolly pine, yellow-poplar, American sycamore.
CeB2---------- Cecil	7C	Slight	Moderate	Moderate	Slight	Loblolly pine--------- Shortleaf pine------- Virginia pine--------- White oak------------ Southern red oak----- Hickory-------------- Black oak------------	77 62 68 67 --- --- ---	105 92 105 49 --- --- ---	Loblolly pine, shortleaf pine.
ChA---------- Chewacla	7W	Slight	Moderate	Slight	Moderate	Yellow-poplar--------- Loblolly pine--------- Sweetgum------------- Water oak------------ Green ash------------ Southern red oak----- Blackgum------------- Red maple------------ Willow oak----------- American sycamore----	96 95 100 90 --- --- --- --- --- ---	100 142 138 86 --- --- --- --- --- ---	Yellow-poplar, loblolly pine, sweetgum, American sycamore.
CxD[5]: Cliffield------	2R	Moderate	Moderate	Moderate	Moderate	Chestnut oak--------- Scarlet oak---------- Virginia pine--------- Shortleaf pine------- Red maple------------ Black locust--------- Pitch pine---------- White oak------------ Black oak------------ Northern red oak----- Hickory--------------	50 50 --- --- --- --- --- --- --- --- ---	34 34 --- --- --- --- --- --- --- --- ---	Virginia pine, shortleaf pine, eastern white pine.
Cowee----------	3R	Moderate	Moderate	Slight	Moderate	Chestnut oak--------- Virginia pine--------- Scarlet oak---------- Shortleaf pine------- Eastern white pine-- Yellow-poplar--------- Pitch pine---------- Northern red oak----- Black oak------------ White oak------------ Hickory-------------- Red maple------------ Blackgum-------------	55 63 52 68 78 --- --- --- --- --- --- --- ---	38 96 36 106 139 --- --- --- --- --- --- --- ---	Eastern white pine, shortleaf pine.

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol[1]	Management concerns				Potential productivity			Trees to plant[4]
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index[2]	Volume[3]	
DdB---------- Dillard	12A	Slight	Slight	Slight	Slight	Eastern white pine--	90	166	Eastern white pine, yellow-poplar.
						Shortleaf pine------	75	120	
						Virginia pine-------	80	122	
						Yellow-poplar-------	95	98	
						Hemlock-------------	---	---	
DoB[5]:									
Dogue----------	7A	Slight	Moderate	Slight	Slight	Yellow-poplar-------	93	95	Loblolly pine, yellow-poplar, sweetgum.
						Loblolly pine-------	90	131	
						Southern red oak----	80	62	
						Sweetgum------------	90	106	
						White oak-----------	80	62	
Roanoke--------	7W	Slight	Severe	Severe	Slight	Yellow-poplar-------	98	104	Sweetgum, yellow-poplar.
						Willow oak----------	76	68	
						White oak-----------	75	57	
						Sweetgum------------	90	106	
EdF[5]:									
Edneyville-----	12R	Severe	Severe	Slight	Slight	Eastern white pine--	90	166	Eastern white pine, yellow-poplar, shortleaf pine, northern red oak.
						Northern red oak----	80	---	
						Shortleaf pine------	64	---	
						Yellow-poplar-------	98	104	
						Chestnut oak--------	---	---	
						Scarlet oak---------	---	---	
						Black oak-----------	---	---	
Chestnut-------	10R	Severe	Severe	Slight	Moderate	Eastern white pine--	78	139	Eastern white pine, yellow-poplar, shortleaf pine, northern red oak.
						Northern red oak----	76	58	
						Yellow-poplar-------	97	102	
						Scarlet oak---------	68	50	
						White oak-----------	70	52	
						Black oak-----------	71	53	
						Chestnut oak--------	69	51	
						Shortleaf pine------	---	---	
						Hemlock-------------	---	---	
EvD[5]:									
Evard----------	8R	Moderate	Moderate	Slight	Slight	Shortleaf pine------	73	116	Shortleaf pine, eastern white pine, yellow-poplar, northern red oak.
						Pitch pine----------	---	---	
						Virginia pine-------	69	107	
						Eastern white pine--	93	172	
						Yellow-poplar-------	95	98	
						White oak-----------	75	57	
						Northern red oak----	---	---	
						Hickory-------------	---	---	
Cowee----------	7R	Moderate	Moderate	Slight	Moderate	Shortleaf pine------	68	106	Eastern white pine, shortleaf pine.
						Chestnut oak--------	55	38	
						Virginia pine-------	63	96	
						Scarlet oak---------	52	36	
						Eastern white pine--	78	139	
						Yellow-poplar-------	---	---	
						Pitch pine----------	---	---	
						Northern red oak----	---	---	
						Black oak-----------	---	---	
						White oak-----------	---	---	
						Hickory-------------	---	---	
						Red maple-----------	---	---	
						Blackgum------------	---	---	

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol[1]	Management concerns				Potential productivity			Trees to plant[4]
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index[2]	Volume[3]	
EvE[5], EvF[5]:									
Evard	8R	Severe	Severe	Slight	Slight	Shortleaf pine	73	116	Shortleaf pine, eastern white pine, yellow-poplar, northern red oak.
						Pitch pine	---	---	
						Virginia pine	69	107	
						Eastern white pine	93	172	
						Yellow-poplar	95	98	
						White oak	75	57	
						Northern red oak	---	---	
						Hickory	---	---	
Cowee	7R	Severe	Severe	Slight	Moderate	Shortleaf pine	68	106	Eastern white pine, shortleaf pine.
						Chestnut oak	55	38	
						Virginia pine	63	96	
						Scarlet oak	53	36	
						Eastern white pine	78	139	
						Yellow-poplar	---	---	
						Pitch pine	---	---	
						Northern red oak	---	---	
						Black oak	---	---	
						White oak	---	---	
						Hickory	---	---	
						Red maple	---	---	
						Blackgum	---	---	
FcD[5]:									
Fannin	8R	Moderate	Moderate	Slight	Slight	Shortleaf pine	75	120	Eastern white pine, shortleaf pine, yellow-poplar.
						Yellow-poplar	96	100	
						Northern red oak	---	---	
						Eastern white pine	89	164	
						Pitch pine	---	---	
						Virginia pine	---	---	
						Scarlet oak	---	---	
						Chestnut oak	---	---	
Cowee	7R	Moderate	Moderate	Slight	Moderate	Shortleaf pine	68	106	Eastern white pine, shortleaf pine, Scotch pine, Norway spruce.
						Chestnut oak	55	38	
						Virginia pine	63	96	
						Scarlet oak	52	36	
						Eastern white pine	78	139	
						Yellow-poplar	---	---	
						Pitch pine	---	---	
						Northern red oak	---	---	
						Black oak	---	---	
						White oak	---	---	
						Hickory	---	---	
						Red maple	---	---	
						Blackgum	---	---	
FcE[5], FcF[5]:									
Fannin	8R	Severe	Severe	Slight	Slight	Shortleaf pine	75	120	Eastern white pine, shortleaf pine, yellow-poplar.
						Yellow-poplar	96	100	
						Northern red oak	---	---	
						Eastern white pine	89	164	
						Pitch pine	---	---	
						Virginia pine	---	---	
						Scarlet oak	---	---	
						Chestnut oak	---	---	

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol[1]	Management concerns				Potential productivity			Trees to plant[4]
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index[2]	Volume[3]	
FcE[5], FcF[5]:									
Cowee	7R	Severe	Severe	Slight	Moderate	Shortleaf pine	68	106	Eastern white pine, shortleaf pine.
						Chestnut oak	55	38	
						Virginia pine	63	96	
						Scarlet oak	52	36	
						Eastern white pine	78	139	
						Yellow-poplar	---	---	
						Pitch pine	---	---	
						Northern red oak	---	---	
						Black oak	---	---	
						White oak	---	---	
						Hickory	---	---	
						Red maple	---	---	
						Blackgum	---	---	
GrE Grover	8R	Severe	Severe	Slight	Slight	Loblolly pine	80	110	Loblolly pine, Virginia pine, yellow-poplar, eastern white pine.
						White oak	---	---	
						Southern red oak	---	---	
						Sweetgum	---	---	
						Hickory	---	---	
						Black oak	---	---	
						Scarlet oak	---	---	
						Yellow-poplar	---	---	
						Chestnut oak	---	---	
HaC Hayesville	11A	Slight	Slight	Slight	Slight	Eastern white pine	84	153	Eastern white pine, shortleaf pine, black locust.
						Yellow-poplar	92	93	
						Northern red oak	---	---	
						Pitch pine	---	---	
						Shortleaf pine	71	112	
						Virginia pine	73	113	
HaD Hayesville	11R	Moderate	Moderate	Slight	Slight	Eastern white pine	84	153	Eastern white pine, shortleaf pine, black locust.
						Yellow-poplar	92	93	
						Northern red oak	---	---	
						Pitch pine	---	---	
						Shortleaf pine	71	112	
						Virginia pine	73	113	
HwB2, HwC2 Hiwassee	7C	Slight	Moderate	Moderate	Slight	Loblolly pine	71	95	Loblolly pine, shortleaf pine.
						Shortleaf pine	68	106	
						Northern red oak	---	---	
						White oak	70	52	
						Southern red oak	75	57	
						Virginia pine	---	---	
						Hickory	---	---	
						Black oak	---	---	
MaC2 Madison	7C	Slight	Moderate	Moderate	Slight	Loblolly pine	72	96	Loblolly pine, shortleaf pine.
						Shortleaf pine	62	92	
						Virginia pine	66	102	
						White oak	---	---	
						Black oak	---	---	
						Hickory	---	---	

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol[1]	Management concerns				Potential productivity			Trees to plant[4]
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index[2]	Volume[3]	
MaD2---------- Madison	7R	Moderate	Moderate	Moderate	Slight	Loblolly pine-------	72	96	Loblolly pine, shortleaf pine.
						Shortleaf pine------	62	92	
						Virginia pine-------	66	102	
						White oak-----------	---	---	
						Black oak-----------	---	---	
						Hickory-------------	---	---	
MsB---------- Masada	8A	Slight	Slight	Slight	Slight	Loblolly pine-------	84	118	Loblolly pine, yellow-poplar, eastern white pine.
						Southern red oak----	70	52	
						Virginia pine-------	74	114	
						Shortleaf pine------	66	101	
						Yellow-poplar-------	88	86	
OsA---------- Ostin	8F	Slight	Slight	Moderate	Slight	Yellow-poplar-------	100	107	Eastern white pine, loblolly pine, yellow-poplar, American sycamore, black walnut.
						American sycamore---	---	---	
						River birch---------	---	---	
						Red maple-----------	---	---	
						Black locust--------	---	---	
						Black cherry--------	---	---	
						Eastern hemlock-----	---	---	
						Virginia pine-------	---	---	
						Eastern white pine--	---	---	
PaC2---------- Pacolet	6C	Slight	Moderate	Moderate	Slight	Shortleaf pine------	62	92	Loblolly pine, shortleaf pine.
						Loblolly pine-------	78	107	
						Yellow-poplar-------	81	73	
						Black oak-----------	---	---	
						White oak-----------	---	---	
						Virginia pine-------	---	---	
PaD2---------- Pacolet	6R	Moderate	Moderate	Moderate	Slight	Shortleaf pine------	62	92	Loblolly pine, shortleaf pine.
						Loblolly pine-------	78	107	
						Yellow-poplar-------	81	73	
						Black oak-----------	---	---	
						White oak-----------	---	---	
						Virginia pine-------	---	---	
PbC2[5]: Pacolet--------	6C	Slight	Moderate	Moderate	Slight	Shortleaf pine------	62	92	Loblolly pine, shortleaf pine.
						Loblolly pine-------	78	107	
						Yellow-poplar-------	81	73	
						Black oak-----------	---	---	
						White oak-----------	---	---	
						Virginia pine-------	---	---	
Bethlehem------	6D	Slight	Slight	Slight	Moderate	Shortleaf pine------	60	88	Shortleaf pine, loblolly pine.
						Virginia pine-------	76	117	
						Scarlet oak---------	73	55	
						Chestnut oak--------	64	47	
						White oak-----------	---	---	
						Black oak-----------	---	---	
						Loblolly pine-------	---	---	
PbD2[5]: Pacolet--------	6R	Moderate	Moderate	Moderate	Slight	Shortleaf pine------	62	92	Loblolly pine, shortleaf pine.
						Loblolly pine-------	78	107	
						Yellow-poplar-------	81	73	
						Black oak-----------	---	---	
						White oak-----------	---	---	
						Virginia pine-------	---	---	

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol[1]	Management concerns				Potential productivity			Trees to plant[4]
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index[2]	Volume[3]	
PbD2[5]:									
Bethlehem	6R	Moderate	Moderate	Slight	Moderate	Shortleaf pine	60	88	Shortleaf pine, loblolly pine.
						Virginia pine	76	117	
						Scarlet oak	73	55	
						Chestnut oak	64	47	
						White oak	---	---	
						Black oak	---	---	
						Loblolly pine	---	---	
RnE	8R	Severe	Severe	Slight	Slight	Loblolly pine	80	110	Loblolly pine, shortleaf pine, yellow-poplar, eastern white pine.
Rion						Shortleaf pine	70	110	
						Sweetgum	80	79	
						White oak	70	52	
						Yellow-poplar	90	90	
						Hickory	---	---	
						Black oak	---	---	
						Scarlet oak	---	---	
						Chestnut oak	---	---	
RoF[5]:									
Rion	8R	Severe	Severe	Slight	Slight	Loblolly pine	80	110	Loblolly pine, shortleaf pine, yellow-poplar, eastern white pine.
						Shortleaf pine	70	110	
						Sweetgum	80	79	
						White oak	70	52	
						Yellow-poplar	90	90	
						Hickory	---	---	
						Black oak	---	---	
						Scarlet oak	---	---	
						Chestnut oak	---	---	
Ashlar	7R	Severe	Severe	Severe	Moderate	Loblolly pine	75	101	Loblolly pine, shortleaf pine, eastern white pine, Virginia pine.
						Virginia pine	60	91	
						Shortleaf pine	60	88	
Rock outcrop.									
RtE[5]:									
Rion	8R	Severe	Severe	Slight	Slight	Loblolly pine	80	110	Loblolly pine, shortleaf pine, yellow-poplar, eastern white pine.
						Shortleaf pine	70	110	
						Sweetgum	80	79	
						White oak	70	52	
						Yellow-poplar	90	90	
						Hickory	---	---	
						Black oak	---	---	
						Scarlet oak	---	---	
						Chestnut oak	---	---	
Cliffside	6R	Severe	Severe	Moderate	Moderate	Virginia pine	61	93	Shortleaf pine, loblolly pine, Virginia pine.
						Chestnut oak	56	39	
						Scarlet oak	---	---	
						White oak	---	---	
						Shortleaf pine	---	---	

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol[1]	Management concerns				Potential productivity			Trees to plant[4]
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index[2]	Volume[3]	
RvA---------- Riverview	9A	Slight	Slight	Slight	Slight	Yellow-poplar-------	110	124	Loblolly pine, yellow-poplar, sweetgum, black walnut, American sycamore.
						Loblolly pine-------	100	154	
						Sweetgum----------	100	138	
						American sycamore---	---	---	
SkB2---------- Skyuka	6C	Slight	Slight	Moderate	Slight	Yellow-poplar-------	85	81	Shortleaf pine, Virginia pine, loblolly pine, yellow-poplar.
						Red maple----------	---	---	
						Shortleaf pine------	---	---	
						Virginia pine-------	---	---	
						Sweetgum----------	---	---	
						Loblolly pine-------	---	---	
TaC[5]:									
Tate----------	6A	Slight	Slight	Slight	Slight	Yellow-poplar-------	92	93	Eastern white pine, yellow-poplar.
						Eastern white pine--	89	164	
						Northern red oak----	---	---	
						Black locust--------	---	---	
						Hemlock------------	---	---	
						White oak----------	---	---	
Greenlee-------	8X	Slight	Moderate	Moderate	Slight	Yellow-poplar-------	101	109	Eastern white pine, yellow-poplar.
						Eastern hemlock-----	---	---	
						White oak----------	80	62	
						Northern red oak----	---	---	
						Red maple----------	---	---	
						Eastern white pine--	98	182	
						Black locust--------	---	---	
TaD[5]:									
Tate----------	6R	Moderate	Moderate	Slight	Slight	Yellow-poplar-------	92	83	Eastern white pine, yellow-poplar.
						Eastern white pine--	89	164	
						Northern red oak----	---	---	
						Black locust--------	---	---	
						Hemlock------------	---	---	
						White oak----------	---	---	
Greenlee-------	8X	Moderate	Moderate	Moderate	Slight	Yellow-poplar-------	101	109	Eastern white pine, yellow-poplar.
						Eastern hemlock-----	---	---	
						White oak----------	80	62	
						Northern red oak----	---	---	
						Red maple----------	---	---	
						Eastern white pine--	98	182	
						Black locust--------	---	---	
TgE[5]:									
Tate----------	6R	Severe	Severe	Slight	Slight	Yellow-poplar-------	92	83	Eastern white pine, yellow-poplar.
						Eastern white pine--	89	164	
						Northern red oak----	---	---	
						Black locust--------	---	---	
						Hemlock------------	---	---	
						White oak----------	---	---	

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol[1]	Management concerns				Potential productivity			Trees to plant[4]
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index[2]	Volume[3]	
TgE[5]:									
Greenlee	8R	Severe	Severe	Moderate	Slight	Yellow-poplar	101	109	Eastern white pine, yellow-poplar.
						Eastern hemlock	---	---	
						White oak	80	62	
						Northern red oak	---	---	
						Red maple	---	---	
						Eastern white pine	98	182	
						Black locust	---	---	
WeA	8W	Slight	Severe	Moderate	Moderate	Yellow-poplar	100	107	Yellow-poplar, green ash, sweetgum.
Wehadkee						Sweetgum	97	128	
						Green ash	89	64	
						American sycamore	---	---	
						River birch	---	---	
						Black willow	---	---	
						Red maple	---	---	

[1] The number in the ordination symbol denotes potential productivity, in cubic meters per hectare per year, for a group or range of site indices for the indicator species (first tree listed under "Common trees"). One cubic meter per hectare per year equals 14.3 cubic feet per acre per year.

[2] Site indices were assigned using available plot data based on native stands. Where available plot data was insufficient, indices for some species were derived from a comparison curve (Olson and Della-Bianca, USFS, SEFES Pap. 104). Where no data existed, the site index was based on data from soils with similar properties. Eroded phases were reduced by one productivity class. Site indices for Chewacla and Wehadkee soils were based on available data and SITEQUAL (Computerized Site Evaluation, USFS, Gen. Tech. Rep. SO-62, July 1986). Improved loblolly pine plantations may have significantly higher potential productivity than the values shown. Productivity values shown for Wehadkee soils are attainable only in areas where flooding is brief in duration.

[3] Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands. Cubic feet can be converted into board feet by multiplying by about 5.

[4] If hardwoods are desired on a forest site, the natural reproduction (seeds and sprouts) of acceptable species should be used. Special site preparation techniques may be needed. Planting hardwoods on a specific site should be based on the recommendations of a forester.

[5] See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
ApB Appling	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
ArA Arkaqua	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.	Moderate: wetness, flooding.
AsF*:					
Ashe	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cleveland Rock outcrop.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
BrC Brevard	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
BuB Buncombe	Severe: flooding.	Moderate: too sandy.	Moderate: too sandy, flooding.	Moderate: too sandy.	Severe: droughty.
CeB2 Cecil	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
ChA Chewacla	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
CxD*:					
Cliffield	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Moderate: large stones, slope.	Severe: slope.
Cowee	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
DdB Dillard	Severe: flooding.	Slight	Moderate: slope, wetness, percs slowly.	Slight	Slight.
DoB*:					
Dogue	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: slope, small stones, wetness.	Moderate: wetness.	Moderate: wetness.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
DoB*:					
Roanoke	Severe: flooding, wetness, percs slowly.	Severe: wetness, too acid, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: too acid, wetness.
EdF*:					
Edneyville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Chestnut	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
EvD*:					
Evard	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Cowee	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
EvE*, EvF*:					
Evard	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cowee	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
FcD*:					
Fannin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Cowee	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
FcE*, FcF*:					
Fannin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cowee	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
GrE	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Grover					
HaC	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Hayesville					
HaD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Hayesville					
HwB2	Slight	Slight	Moderate: slope.	Slight	Slight.
Hiwassee					
HwC2	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Hiwassee					

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
MaC2 Madison	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
MaD2 Madison	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
MsB Masada	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
OsA Ostin	Severe: flooding.	Moderate: wetness, too sandy, flooding.	Moderate: small stones, wetness, flooding.	Moderate: flooding.	Severe: droughty.
PaC2 Pacolet	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
PaD2 Pacolet	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
PbC2*: Pacolet	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Bethlehem	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight	Severe: small stones.
PbD2*: Pacolet	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Bethlehem	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Moderate: slope.	Severe: small stones, slope.
Pt*. Pits, quarries					
RnE Rion	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
RoF*: Rion	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ashlar	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Slight	Severe: droughty, slope.
Rock outcrop.					
RtE*: Rion	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cliffside	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
RvA Riverview	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
SkB2 Skyuka	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
TaC*: Tate	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: large stones.	Severe: large stones.
Greenlee	Moderate: large stones, slope.	Moderate: large stones, slope.	Severe: large stones, slope, small stones.	Moderate: large stones.	Severe: droughty.
TaD*: Tate	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: large stones, slope.	Severe: large stones.
Greenlee	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Moderate: large stones, slope.	Severe: droughty, slope.
TgE*: Tate	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: large stones.
Greenlee	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: droughty, slope.
Ud, UoB. Udorthents					
WeA Wehadkee	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
ApB---Appling	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ArA---Arkaqua	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
AsF*:										
Ashe	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Cleveland	Very poor.	Very poor.	Poor	Fair	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Rock outcrop.										
BrC---Brevard	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
BuB---Buncombe	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
CeB2---Cecil	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
ChA---Chewacla	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
CxD*:										
Cliffield	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Cowee	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
DdB---Dillard	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
DoB*:										
Dogue	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Roanoke	Poor	Poor	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
EdF*:										
Edneyville	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Chestnut	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
EvD*:										
Evard	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Cowee	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
EvE*, EvF*:										
Evard	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Cowee	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
FcD*:										
Fannin	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Cowee	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
FcE*, FcF*:										
Fannin	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Cowee	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
GrE---- Grover	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
HaC---- Hayesville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HaD---- Hayesville	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
HwB2---- Hiwassee	Fair	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
HwC2---- Hiwassee	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
MaC2---- Madison	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
MaD2---- Madison	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MsB---- Masada	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
OsA---- Ostin	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
PaC2---- Pacolet	Very poor.	Poor	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
PaD2---- Pacolet	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
PbC2*:										
Pacolet	Very poor.	Poor	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Bethlehem	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
PbD2*:										
Pacolet	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Bethlehem	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Pt*.										
Pits, quarries										
RnE	Very poor.	Poor	Poor	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Rion										
RoF*:										
Rion	Very poor.	Poor	Poor	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Ashlar	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Rock outcrop.										
RtE*:										
Rion	Very poor.	Poor	Poor	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Cliffside	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
RvA	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Riverview										
SkB2	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Skyuka										
TaC*:										
Tate	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Greenlee	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
TaD*:										
Tate	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Greenlee	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
TgE*:										
Tate	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Greenlee	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Ud, UoB.										
Udorthents										

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
WeA---------- Wehadkee	Very poor.	Poor	Poor	Fair	Fair	Good	Fair	Poor	Fair	Fair.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
ApB Appling	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Moderate: low strength.	Slight.
ArA Arkaqua	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding.	Moderate: wetness, flooding.
AsF*:						
Ashe	Severe: depth to rock, slope, slippage.	Severe: slope, slippage.	Severe: slope, depth to rock, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope.
Cleveland	Severe: depth to rock, slope, slippage.	Severe: slope, depth to rock, slippage.	Severe: depth to rock, slope, slippage.	Severe: slope, depth to rock, slippage.	Severe: depth to rock, slope, slippage.	Severe: slope, depth to rock.
Rock outcrop.						
BrC Brevard	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: large stones, slope.
BuB Buncombe	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: droughty.
CeB2 Cecil	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Moderate: low strength.	Slight.
ChA Chewacla	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
CxD*:						
Cliffield	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cowee	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
DdB Dillard	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Moderate: low strength, wetness.	Slight.
DoB*:						
Dogue	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength.	Moderate: wetness.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
DoB*:						
Roanoke	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness.	Severe: too acid, wetness.
EdF*:						
Edneyville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Chestnut	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
EvD*, EvE*, EvF*:						
Evard	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cowee	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
FcD*, FcE*, FcF*:						
Fannin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Cowee	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
GrE	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Grover						
HaC	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
Hayesville						
HaD	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hayesville						
HwB2	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Moderate: low strength.	Slight.
Hiwassee						
HwC2	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.
Hiwassee						
MaC2	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.
Madison						
MaD2	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Madison						
MsB	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Masada						
OsA	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: droughty.
Ostin						

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
PaC2 Pacolet	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.
PaD2 Pacolet	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
PbC2*: Pacolet	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.
Bethlehem	Moderate: depth to rock, too clayey, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: low strength, slope.	Severe: small stones.
PbD2*: Pacolet	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Bethlehem	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Pt*. Pits, quarries						
RnE Rion	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
RoF*: Rion	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ashlar	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
Rock outcrop.						
RtE*: Rion	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cliffside	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
RvA Riverview	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
SkB2 Skyuka	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: shrink-swell, wetness.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
TaC*:						
Tate	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Severe: large stones.
Greenlee	Severe: cutbanks cave, large stones.	Severe: large stones.	Severe: large stones.	Severe: slope, large stones.	Severe: large stones.	Severe: droughty.
TaD*, TgE*:						
Tate	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: large stones.
Greenlee	Severe: cutbanks cave, large stones, slope.	Severe: slope, large stones, slippage.	Severe: slope, large stones, slippage.	Severe: slope, large stones, slippage.	Severe: slope, large stones, slippage.	Severe: droughty, slope.
Ud, UoB. Udorthents						
WeA Wehadkee	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
ApB Appling	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, hard to pack.
ArA Arkaqua	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
AsF*: Ashe	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.
Cleveland	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Rock outcrop.					
BrC Brevard	Moderate: percs slowly, slope.	Severe: slope.	Severe: seepage.	Moderate: slope.	Fair: too clayey, slope.
BuB Buncombe	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
CeB2 Cecil	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, hard to pack.
ChA Chewacla	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
CxD*: Cliffield	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Cowee	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
DdB Dillard	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock, wetness, too clayey.	Severe: wetness.	Fair: too clayey.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
DoB*:					
Dogue	Severe: wetness, percs slowly.	Severe: seepage, flooding, wetness.	Severe: seepage, wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
Roanoke	Severe: wetness, percs slowly.	Severe: seepage.	Severe: seepage, wetness.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
EdF*:					
Edneyville	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Chestnut	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
EvD*, EvE*, EvF*:					
Evard	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Cowee	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
FcD*, FcE*, FcF*:					
Fannin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Cowee	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
GrE Grover	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
HaC Hayesville	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: too clayey, hard to pack, slope.
HaD Hayesville	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
HwB2 Hiwassee	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, hard to pack.
HwC2 Hiwassee	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, hard to pack, slope.
MaC2 Madison	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: too clayey.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MaD2 Madison	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
MsB Masada	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
OsA Ostin	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, small stones.
PaC2 Pacolet	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: too clayey, slope.
PaD2 Pacolet	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
PbC2*: Pacolet	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: too clayey, slope.
Bethlehem	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
PbD2*: Pacolet	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Bethlehem	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Pt*. Pits, quarries					
RnE Rion	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
RoF*: Rion	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Ashlar	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
Rock outcrop.					
RtE*: Rion	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
RtE*:					
Cliffside	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
RvA	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: thin layer.
SkB2	Moderate: percs slowly, wetness.	Moderate: seepage, slope, wetness.	Severe: too clayey, wetness.	Moderate: wetness.	Poor: too clayey, hard to pack.
TaC*:					
Tate	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: too clayey, large stones, slope.
Greenlee	Severe: large stones.	Severe: seepage, slope, large stones.	Severe: seepage, large stones.	Severe: seepage.	Poor: large stones.
TaD*, TgE*:					
Tate	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
Greenlee	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: large stones, slope.
Ud, UoB.					
Udorthents					
WeA	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness, thin layer.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ApB Appling	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
ArA Arkaqua	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
AsF*: Ashe	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
Cleveland	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop.				
BrC Brevard	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones, slope.
BuB Buncombe	Good	Probable	Improbable: too sandy.	Poor: too sandy.
CeB2 Cecil	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
ChA Chewacla	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
CxD*: Cliffield	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Cowee	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
DdB Dillard	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
DoB*: Dogue	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too clayey.
Roanoke	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness, too acid.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
EdF*:				
Edneyville	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Chestnut	Poor: depth to rock, slope.	Improbable: excess fines, thin layer.	Improbable: excess fines, thin layer.	Poor: small stones, slope.
EvD*:				
Evard	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Cowee	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
EvE*, EvF*:				
Evard	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Cowee	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
FcD*:				
Fannin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Cowee	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
FcE*, FcF*:				
Fannin	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Cowee	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
GrE Grover	Poor: slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
HaC Hayesville	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
HaD Hayesville	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
HwB2, HwC2 Hiwassee	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
MaC2 Madison	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MaD2 Madison	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
MsB Masada	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey, small stones.
OsA Ostin	Fair: large stones, wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
PaC2 Pacolet	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
PaD2 Pacolet	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
PbC2*: Pacolet	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Bethlehem	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
PbD2*: Pacolet	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Bethlehem	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
Pt*. Pits, quarries				
RnE Rion	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
RoF*: Rion	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Ashlar	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Rock outcrop.				
RtE*: Rion	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RtE*:				
Cliffside	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
RvA	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
SkB2	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
TaC*:				
Tate	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
Greenlee	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim.
TaD*:				
Tate	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim, slope.
Greenlee	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
TgE*:				
Tate	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim, slope.
Greenlee	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
Ud, UoB. Udorthents				
WeA Wehadkee	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "moderate" and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
ApB Appling	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Slope	Soil blowing	Favorable.
ArA Arkaqua	Moderate: seepage.	Severe: wetness.	Flooding	Wetness, flooding.	Wetness	Favorable.
AsF*:						
Ashe	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Cleveland	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
BrC Brevard	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope	Slope.
BuB Buncombe	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty, rooting depth.
CeB2 Cecil	Moderate: seepage, slope.	Severe: piping, hard to pack.	Deep to water	Slope	Favorable	Favorable.
ChA Chewacla	Moderate: seepage.	Severe: piping, hard to pack, wetness.	Flooding	Wetness, flooding.	Wetness	Wetness.
CxD*:						
Cliffield	Severe: slope.	Severe: piping.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Cowee	Severe: slope.	Severe: thin layer, piping.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
DdB Dillard	Moderate: slope.	Moderate: thin layer.	Slope	Slope, wetness.	Wetness	Favorable.
DoB*:						
Dogue	Moderate: seepage, slope.	Severe: wetness.	Slope	Wetness, soil blowing, slope.	Wetness, soil blowing.	Favorable.
Roanoke	Severe: seepage.	Severe: wetness.	Percs slowly, too acid.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
EdF*:						
Edneyville	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, droughty.	Slope	Slope, droughty.
Chestnut	Severe: seepage, slope.	Severe: piping, thin layer.	Deep to water	Slope, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
EvD*, EvE*, EvF*:						
Evard	Severe: slope.	Severe: seepage, piping.	Deep to water	Slope, soil blowing.	Slope, too sandy, soil blowing.	Slope.
Cowee	Severe: slope.	Severe: thin layer, piping.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
FcD*, FcE*, FcF*:						
Fannin	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope	Slope.
Cowee	Severe: slope.	Severe: thin layer, piping.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
GrE Grover	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope	Slope.
HaC, HaD Hayesville	Severe: seepage, slope.	Severe: hard to pack.	Deep to water	Slope	Slope	Slope.
HwB2 Hiwassee	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Slope	Favorable	Favorable.
HwC2 Hiwassee	Severe: slope.	Severe: hard to pack.	Deep to water	Slope	Slope	Slope.
MaC2, MaD2 Madison	Severe: slope.	Severe: piping, hard to pack.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
MsB Masada	Moderate: seepage, slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope, rooting depth.	Soil blowing	Rooting depth.
OsA Ostin	Severe: seepage.	Severe: seepage.	Flooding, large stones.	Large stones, wetness, flooding.	Large stones, wetness, too sandy.	Large stones, droughty.
PaC2, PaD2 Pacolet	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope	Slope.
PbC2*, PbD2*: Pacolet	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope	Slope.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
PbC2*, PbD2*:						
Bethlehem	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, droughty, soil blowing.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Pt*.						
Pits, quarries						
RnE						
Rion	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, droughty.	Slope, soil blowing.	Slope, droughty.
RoF*:						
Rion	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, droughty.	Slope, soil blowing.	Slope, droughty.
Ashlar	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Slope, depth to rock, soil blowing.	Slope, droughty, depth to rock.
Rock outcrop.						
RtE*:						
Rion	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, droughty.	Slope, soil blowing.	Slope, droughty.
Cliffside	Severe: slope.	Moderate: seepage, large stones.	Deep to water	Slope, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
RvA						
Riverview	Severe: seepage.	Severe: piping.	Deep to water	Flooding	Favorable	Favorable.
SkB2						
Skyuka	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Slope	Favorable	Favorable.
TaC*, TaD*, TgE*:						
Tate	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope	Slope, large stones.	Large stones, slope.
Greenlee	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Slope, large stones, droughty.	Slope, large stones, too sandy.	Large stones, slope, droughty.
Ud, UoB.						
Udorthents						
WeA						
Wehadkee	Moderate: seepage.	Severe: piping, wetness.	Flooding	Wetness, soil blowing, flooding.	Wetness, soil blowing.	Wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
ApB	0-8	Sandy loam	SM, SC-SM	A-2	0	0-5	86-100	80-100	55-91	15-35	<35	NP-7
Appling	8-55	Sandy clay, clay loam, clay.	MH, ML, CL	A-7	0	0-5	95-100	90-100	70-95	51-80	41-74	15-30
	55-65	Sandy clay, clay loam, sandy clay loam.	SC, CL	A-4, A-6, A-7	0	0-5	95-100	85-100	70-90	40-75	25-45	8-22
ArA	0-10	Loam	SM	A-2, A-4	0	0	98-100	95-100	60-90	30-50	<35	NP-7
Arkaqua	10-38	Silt loam, sandy clay loam, loam.	ML, SM, CL-ML	A-4	0	0	96-100	95-100	60-100	36-70	<35	NP-7
	38-60	Variable	---	---	---	---	---	---	---	---	---	---
AsF*:												
Ashe	0-4	Sandy loam	SM, SC-SM	A-2, A-4	5-15	15-30	80-90	75-90	65-90	30-49	25-35	NP-7
	4-14	Loam, sandy loam, fine sandy loam.	SM, SC-SM	A-4	0-10	5-30	85-100	80-95	60-95	35-49	25-35	NP-7
	14-32	Sandy loam	SM	A-2, A-4	0-10	15-30	75-95	70-95	55-95	30-49	---	NP
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
Cleveland	0-13	Sandy loam	SM	A-2, A-4	2-10	5-25	70-90	60-80	50-75	20-50	<30	NP-3
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
Rock outcrop.												
BrC	0-6	Sandy loam	SM, SC-SM	A-4, A-2-4	0-5	5-15	90-100	75-100	50-80	30-50	25-35	NP-7
Brevard	6-65	Sandy clay loam, clay loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6, A-7-5, A-7-6	0-10	5-15	95-100	95-100	85-97	51-75	29-50	5-15
BuB	0-15	Loamy sand	SM, SP-SM	A-2, A-3	0	0	98-100	98-100	90-97	7-32	---	NP
Buncombe	15-65	Loamy sand, loamy fine sand, sand.	SM, SP-SM	A-2, A-3	0	0	98-100	98-100	98-100	7-32	---	NP
CeB2	0-6	Sandy clay loam.	SM, SC, CL, ML	A-4, A-6	0	0-5	75-100	75-100	68-95	38-81	21-35	3-17
Cecil	6-58	Clay, clay loam.	MH, ML, CH	A-7, A-5	0	0-5	97-100	92-100	72-100	55-95	41-80	9-37
	58-65	Sandy clay loam, clay loam.	SM, SC, ML, CL	A-4, A-6	0	0-5	75-100	75-100	68-95	38-81	21-35	3-15

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
ChA---------- Chewacla	0-7	Loam----------	ML, CL, CL-ML	A-4, A-6, A-7	0	0	98-100	95-100	70-100	55-90	25-49	4-20
	7-21	Sandy clay loam, loam, sandy loam.	SM, SC-SM, ML, CL	A-4, A-7-6, A-6	0	0	96-100	95-100	60-100	36-70	20-45	2-15
	21-65	Silt loam, clay loam, silty clay loam.	ML, MH, CL, CH	A-4, A-6, A-7	0	0	85-100	75-100	60-100	51-98	22-61	4-28
CxD*:												
Cliffield----	0-4	Cobbly loam---	SM	A-2-4, A-4	0-10	10-30	80-90	70-85	60-75	30-50	<35	NP-10
	4-16	Very gravelly sandy clay loam, very cobbly clay loam, very cobbly sandy clay loam.	ML, SM, GM, CL	A-2, A-4, A-6, A-7	5-20	20-40	70-85	50-75	35-70	25-60	<45	NP-15
	16-33	Very stony sandy clay loam, extremely stony clay loam, very cobbly loam.	ML, SM, GM, CL	A-2, A-4, A-6, A-7	30-40	20-30	55-80	40-80	30-75	25-60	<45	NP-15
	33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
Cowee--------	0-6	Gravelly sandy loam.	SM, SC-SM, ML	A-2-4, A-4, A-5, A-2	0-10	0-15	75-95	65-85	55-75	20-51	26-41	NP-12
	6-25	Gravelly sandy clay loam, sandy clay loam, clay loam.	SC, CL, ML, SM	A-4, A-6, A-7, A-2	0-10	0-15	47-99	45-90	32-85	17-60	26-56	5-22
	25-46	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
DdB---------- Dillard	0-11	Sandy loam----	SM, SC, CL, ML	A-2, A-4	0	0-2	95-100	95-100	60-90	30-55	<35	NP-10
	11-48	Clay loam, sandy clay loam, loam.	CL, ML, SC	A-4, A-6, A-7	0	0-2	95-100	85-100	60-95	45-70	30-45	7-22
	48-65	Variable------	---	---	---	---	---	---	---	---	---	---
DoB*:												
Dogue--------	0-6	Sandy loam----	SM, SC, SC-SM	A-2, A-4	0	0	95-100	75-100	50-100	20-50	<25	NP-10
	6-58	Clay loam, clay, sandy clay.	CL, CH, SC	A-6, A-7	0	0	95-100	75-100	65-100	40-90	35-60	16-40
	58-62	Stratified sand to sandy clay loam.	SM, SC, SP-SM, SC-SM	A-2, A-4, A-1	0	0	80-100	60-100	35-100	10-40	<30	NP-10

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
DoB*:												
Roanoke	0-5	Loam	SC-SM, CL-ML, CL, SC	A-4, A-6	0	0	95-100	85-100	60-100	35-90	20-35	5-16
	5-9	Clay loam, silty clay loam.	CL	A-6, A-7	0	0	95-100	85-100	80-100	80-95	35-45	14-20
	9-41	Clay, silty clay, clay loam.	CH, CL	A-7	0	0	90-100	85-100	85-100	65-95	45-70	22-40
	41-65	Stratified sand to clay.	CL-ML, GM-GC, CH, SM	A-1, A-2, A-4	0	0-5	40-100	35-100	25-95	15-90	10-60	NP-40
EdF*:												
Edneyville	0-3	Sandy loam	SM, SC-SM, MH, ML	A-2, A-4, A-5	0-5	0-5	85-100	80-100	65-95	30-69	25-61	NP-7
	3-31	Fine sandy loam, sandy loam, loam.	SM, SC-SM, ML, CL-ML	A-2, A-4, A-5	0-5	0-5	85-100	80-100	65-95	30-68	25-45	NP-10
	31-65	Sandy loam, gravelly sandy loam, loamy sand.	SM, SC-SM	A-2, A-4, A-5	0-5	0-10	75-100	65-100	60-88	28-49	25-45	NP-10
Chestnut	0-3	Sandy loam	SM, SC-SM, ML, CL-ML	A-4, A-2, A-5	0-5	0-5	85-100	80-95	60-95	30-55	<50	NP-9
	3-20	Gravelly loam, gravelly fine sandy loam, sandy loam.	SM, SC-SM	A-4, A-2, A-5	0-5	0-25	75-98	65-97	60-85	34-49	<45	NP-10
	20-25	Sandy loam, loam, loamy sand.	SM	A-2, A-4	0-5	0-15	75-100	70-100	60-90	15-50	---	NP
	25-48	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
	48	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
EvD*, EvE*, EvF*:												
Evard	0-4	Sandy loam	SM, ML	A-2, A-4	0-5	0-5	80-100	75-100	65-90	20-60	<35	NP-9
	4-21	Sandy clay loam, clay loam.	SM, SC, ML, CL	A-2, A-4, A-6, A-7-6	0-2	0-2	90-100	85-100	60-95	30-70	25-45	7-18
	21-27	Sandy loam, loam, sandy clay loam.	SM, SC, ML, CL	A-2, A-4	0-5	0-5	80-100	75-100	60-95	20-55	<25	NP-9
	27-65	Sandy loam, loam, loamy sand.	SM	A-2, A-4	0-5	0-15	75-100	70-100	60-90	15-50	---	NP

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
EvD*, EvE*, EvF*:												
Cowee	0-6	Gravelly sandy loam.	SM, SC-SM, ML	A-2-4, A-4, A-5, A-2	0-5	0-15	75-95	65-85	55-75	20-51	26-41	NP-12
	6-25	Gravelly sandy clay loam, sandy clay loam, clay loam.	SC, CL, ML, SM	A-4, A-6, A-7, A-2	0-5	0-15	47-99	45-90	32-85	17-60	26-56	5-22
	25-46	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
FcD*, FcE*, FcF*:												
Fannin	0-4	Fine sandy loam.	ML, SM, MH	A-4, A-2, A-5, A-7-5	0-5	0-5	92-100	86-100	60-95	34-85	30-51	NP-18
	4-34	Clay loam, sandy clay loam, loam.	ML, MH, SM	A-4, A-7, A-6	0-5	2-10	97-100	90-100	67-95	40-85	30-55	5-23
	34-65	Loam, sandy loam, fine sandy loam.	SM, ML	A-2, A-4, A-5	0-5	0-15	75-100	70-98	60-90	15-70	30-50	NP-10
Cowee	0-6	Gravelly sandy loam.	SM, SC-SM, ML	A-2-4, A-4, A-5, A-2	0-5	0-15	75-95	65-85	55-75	20-51	26-41	NP-12
	6-25	Gravelly sandy clay loam, sandy clay loam, clay loam.	SC, CL, ML, SM	A-4, A-6, A-7, A-2	0-5	0-15	47-99	45-90	32-85	17-60	26-56	5-22
	25-46	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
GrE Grover	0-6	Loam	MH, SM, SC, ML	A-7-5, A-4, A-5, A-6	0-1	0-5	95-100	90-100	70-100	40-65	30-65	3-24
	6-25	Sandy clay loam, clay loam, loam.	SM, ML, MH	A-6, A-7	0-1	0-5	95-100	90-100	70-100	40-70	38-65	12-30
	25-65	Sandy loam, loam, sandy clay loam.	SM, SC-SM	A-4, A-5, A-2-4, A-2	0-1	0-5	90-100	85-100	65-95	25-49	25-50	NP-10

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
HaC, HaD------ Hayesville	0-7	Fine sandy loam.	SM, SC, ML, CL	A-4	0-5	0-5	90-100	85-95	70-95	35-60	25-35	NP-10
	7-21	Clay loam, clay.	ML, MH, CL, CH	A-6, A-7	0-5	0-5	90-100	85-100	70-100	55-80	36-66	11-35
	21-38	Sandy clay loam, clay loam, loam.	SM, ML, MH, CL	A-6, A-7	0-5	0-5	90-100	90-100	85-95	45-65	36-55	11-25
	38-65	Fine sandy loam, loam, sandy clay loam.	SM, ML, CL, SC	A-4, A-6	0-5	5-15	90-100	90-95	65-90	40-55	25-40	NP-12
HwB2, HwC2---- Hiwassee	0-7	Clay loam-----	CL, ML, CL-ML	A-7-6, A-6, A-4	0	0-2	95-100	95-100	88-100	50-85	25-49	3-23
	7-58	Clay, silty clay, clay loam.	ML, MH	A-7-5, A-7-6	0	0-2	95-100	95-100	80-100	51-95	40-80	12-36
	58-65	Clay loam, sandy clay loam.	SM, SC, ML, CL	A-4, A-6	0	0-2	75-100	75-100	68-95	38-81	21-35	3-15
MaC2, MaD2---- Madison	0-6	Sandy clay loam.	CL, ML, SC	A-4, A-6, A-7-6	0-1	0-3	90-100	85-100	70-95	46-80	30-50	7-20
	6-26	Clay, clay loam, sandy clay.	MH, ML	A-7	0-1	0-3	90-100	85-100	75-100	57-85	43-75	12-35
	26-37	Loam, sandy clay loam, clay loam.	CL	A-4, A-6	0-1	0-3	90-100	85-100	70-95	50-80	20-40	7-20
	37-65	Fine sandy loam, sandy loam, loam, coarse sandy loam.	SM, ML	A-2, A-4	0-1	0-5	85-100	80-100	60-90	26-55	<35	NP-7
MsB---------- Masada	0-9	Sandy loam----	ML, SM, SC, CL	A-4, A-6	0	0-5	90-100	75-98	60-95	35-75	<30	NP-15
	9-18	Loam, sandy clay loam, clay loam.	SM, ML, MH, CL	A-6, A-7	0	0-5	90-100	90-100	85-95	45-65	36-55	11-25
	18-55	Clay loam, clay, gravelly clay.	CH, CL	A-7, A-6	0	0-10	80-100	70-100	65-95	50-80	35-60	15-35
	55-65	Loam, clay loam, gravelly sandy clay loam.	CL, ML	A-6, A-7, A-4	0	0-10	80-100	70-100	65-95	50-80	30-45	7-20

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
OsA---------- Ostin	0-11	Loamy sand----	SM	A-2-4, A-4	0	0-5	90-100	80-95	60-85	20-40	<30	NP-4
	11-22	Very gravelly loamy sand, very gravelly sand, very cobbly coarse sand.	SM, SW, SW-SM, SP-SM	A-1-a, A-1-b	0-15	15-45	60-75	40-55	8-50	1-20	---	NP
	22-28	Gravelly sand, gravelly coarse sand, cobbly coarse sand.	SW, SP, SW-SM, SP-SM	A-1-b	0	0-15	75-90	60-75	3-40	1-10	---	NP
	28-60	Extremely gravelly sand, extremely gravelly coarse sand, extremely cobbly coarse sand.	GW, GP, GW-GM, GP-GM	A-1-a, A-1-b	0-15	20-50	25-70	15-40	3-40	1-10	---	NP
PaC2, PaD2---- Pacolet	0-5	Sandy clay loam.	SC-SM, SC	A-4, A-6	0-1	0-1	95-100	90-100	65-87	36-50	20-40	4-17
	5-29	Sandy clay, clay loam, clay.	ML, MH, CL	A-6, A-7	0-1	0-1	80-100	80-100	60-100	51-75	36-65	11-33
	29-37	Clay loam, sandy clay loam, sandy loam.	CL, CL-ML, SC-SM, SC	A-2, A-4, A-6	0-1	0-2	80-100	70-100	60-80	30-60	20-35	5-15
	37-65	Sandy loam, fine sandy loam, loam.	SM, SC-SM	A-4, A-2-4	0-1	0-2	80-100	70-100	60-90	25-50	<28	NP-6
PbC2*, PbD2*:												
Pacolet------	0-5	Sandy clay loam.	SC-SM, SC	A-4, A-6	0-1	0-1	95-100	90-100	65-87	36-50	20-40	4-17
	5-29	Sandy clay, clay loam, clay.	ML, MH, CL	A-6, A-7	0-1	0-1	80-100	80-100	60-100	51-75	36-65	11-33
	29-37	Clay loam, sandy clay loam, sandy loam.	CL, CL-ML, SC-SM, SC	A-2, A-4, A-6	0-1	0-2	80-100	70-100	60-80	30-60	20-35	5-15
	37-65	Sandy loam, fine sandy loam, loam.	SM, SC-SM	A-4, A-2-4	0-1	0-2	80-100	70-100	60-90	25-50	<28	NP-6
Bethlehem----	0-4	Gravelly coarse sandy loam.	SM, SC, GP-GM, GM, SP-SM	A-2-4, A-4, A-1	0-3	0-20	50-83	35-76	20-60	10-45	<35	NP-10
	4-23	Clay, clay loam, gravelly clay.	MH, CL, CH, ML	A-6, A-7	0-3	0-10	65-100	60-100	55-100	50-85	38-65	14-30
	23-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
Pt*. Pits, quarries												
RnE---------- Rion	0-4	Sandy loam----	SM	A-2, A-4	0-1	0-2	90-100	85-100	60-80	20-45	<35	NP-7
	4-38	Sandy loam, sandy clay loam, clay loam.	SC, SC-SM, CL-ML, CL	A-2, A-4, A-6	0-1	0-2	90-100	85-100	60-85	30-60	20-35	5-15
	38-65	Sandy loam, sandy clay loam, loamy sand.	SC, SM, SC-SM	A-2, A-4, A-6	0-1	0-2	90-100	80-100	60-85	15-50	<36	NP-12
RoF*:												
Rion----------	0-4	Sandy loam----	SM	A-2, A-4	0-1	0-2	90-100	85-100	60-80	20-45	<35	NP-7
	4-38	Sandy loam, sandy clay loam, clay loam.	SC, SC-SM, CL-ML, CL	A-2, A-4, A-6	0-1	0-2	90-100	85-100	60-85	30-60	20-35	5-15
	38-65	Sandy loam, sandy clay loam, loamy sand.	SC, SM, SC-SM	A-2, A-4, A-6	0-1	0-2	90-100	80-100	60-85	15-50	<36	NP-12
Ashlar-------	0-5	Gravelly sandy loam.	GM-GC, SC-SM, GM, SM	A-2, A-4, A-1	0-3	0-5	55-90	50-75	40-70	20-50	<25	NP-6
	5-24	Sandy loam, fine sandy loam, gravelly sandy loam.	GM-GC, SC-SM, GM, SM	A-1, A-2, A-4	0-3	0-8	55-100	50-100	30-75	15-50	<25	NP-6
	24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
Rock outcrop.												
RtE*:												
Rion----------	0-4	Sandy loam----	SM	A-2, A-4	0-1	0-2	90-100	85-100	60-80	20-45	<35	NP-7
	4-38	Sandy loam, sandy clay loam, clay loam.	SC, SC-SM, CL-ML, CL	A-2, A-4, A-6	0-1	0-2	90-100	85-100	60-85	30-60	20-35	5-15
	38-65	Sandy loam, sandy clay loam, loamy sand.	SC, SM, SC-SM	A-2, A-4, A-6	0-1	0-2	90-100	80-100	60-85	15-50	<36	NP-12

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
RtE*:												
Cliffside	0-5	Gravelly sandy loam.	SM, SC	A-1-a, A-4	0-10	0-10	80-90	50-75	30-70	15-50	15-35	NP-7
	5-28	Very cobbly sandy clay loam, very gravelly sandy clay loam, very gravelly clay loam.	SM, SC	A-1-a, A-2-4, A-7-5	0-10	10-40	75-90	30-50	25-50	20-40	15-45	NP-15
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
RvA--- Riverview	0-12	Loam---	CL, CL-ML, ML	A-4, A-6	0	0	100	100	90-100	60-80	15-30	3-14
	12-60	Sandy clay loam, clay loam, loam.	CL, ML, CL-ML	A-4, A-6	0	0	100	100	90-100	60-95	20-40	3-20
SkB2--- Skyuka	0-9	Clay loam---	CL, SC	A-6, A-7-6	0	0-5	95-100	80-100	65-95	40-80	35-50	15-25
	9-52	Clay loam, clay, sandy clay.	CH, MH	A-7-5	0	0-5	95-100	90-100	70-95	55-80	50-75	15-35
	52-60	Sandy clay loam, clay loam, loam.	SC, CL, ML, SM	A-4, A-6, A-7-6	0	0-5	90-100	75-100	50-85	36-75	25-50	8-20
	60-72	Fine sandy loam, clay loam, silty clay loam.	SM, SC, CL, ML	A-2, A-4, A-6, A-7	0	0-5	90-100	75-100	50-90	30-85	20-50	NP-15
TaC*, TaD*:												
Tate	0-10	Cobbly sandy loam.	ML, SM	A-4, A-6	0-10	10-25	85-95	80-95	65-95	40-80	<38	NP-13
	10-46	Clay loam, sandy clay loam, loam.	CL, ML, CL-ML, SC-SM	A-4, A-6	0-5	0-15	94-100	87-100	75-99	40-85	20-40	5-15
	46-70	Gravelly sandy loam, cobbly fine sandy loam, fine sandy loam.	GM, GM-GC, SM, SC-SM	A-4, A-2-4, A-2-6	0-10	5-35	40-100	40-90	35-60	30-50	<35	NP-13
Greenlee	0-11	Cobbly sandy loam.	GM, SM	A-2-4, A-4, A-1-b	15-35	10-30	50-100	50-100	30-85	20-45	<30	NP-7
	11-74	Very cobbly sandy loam, extremely cobbly sandy loam, very cobbly loam.	GM, SM	A-2-4, A-4, A-1-b	5-35	10-55	50-90	50-80	30-60	20-40	<30	NP-7

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
TgE*:												
Tate	0-10	Cobbly sandy loam.	ML, SM	A-4, A-6	0-10	10-25	85-95	80-95	65-95	40-80	<38	NP-13
	10-46	Clay loam, sandy clay loam, loam.	CL, ML, CL-ML, SC-SM	A-4, A-6	0-5	0-15	94-100	87-100	75-99	40-85	20-40	5-15
	46-70	Gravelly sandy loam, cobbly fine sandy loam, fine sandy loam.	GM, GM-GC, SM, SC-SM	A-4, A-2-4, A-2-6	0-10	5-35	40-100	40-90	35-60	30-50	<35	NP-13
Greenlee	0-11	Cobbly sandy loam.	GM, SM	A-2-4, A-4, A-1-b	15-35	10-30	50-100	50-100	30-85	20-45	<30	NP-7
	11-74	Very cobbly sandy loam, extremely cobbly sandy loam, very cobbly loam.	GM, SM	A-2-4, A-4, A-1-b	5-35	10-55	50-90	50-80	30-60	20-40	<30	NP-7
Ud, UoB. Udorthents												
WeA	0-13	Loam	SM, SC, SC-SM	A-2, A-4	0	0	100	95-100	60-90	30-50	<30	NP-10
Wehadkee	13-54	Silt loam, silty clay loam, very fine sandy loam.	CL, CL-ML, ML, SC	A-6, A-7, A-4	0	0	100	99-100	85-100	45-98	20-58	6-25
	54-74	Variable	---	---	---	---	---	---	---	---	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
ApB	0-8	5-20	1.40-1.65	2.0-6.0	0.10-0.15	4.5-6.5	Low	0.24	4	3	.5-2
Appling	8-55	35-60	1.25-1.45	0.6-2.0	0.15-0.17	4.5-5.5	Low	0.28			
	55-65	20-50	1.25-1.45	0.6-2.0	0.12-0.16	4.5-5.5	Low	0.28			
ArA	0-10	10-20	1.20-1.50	0.6-2.0	0.12-0.20	4.5-6.5	Low	0.24	4	5	2-5
Arkaqua	10-38	10-30	1.30-1.60	0.6-2.0	0.12-0.20	4.5-6.0	Low	0.28			
	38-60	---	---	---	---	---	---	----			
AsF*:											
Ashe	0-4	10-20	1.35-1.60	2.0-6.0	0.10-0.13	4.5-6.0	Low	0.17	2	8	1-5
	4-14	10-25	1.35-1.60	2.0-6.0	0.10-0.14	4.5-6.0	Low	0.17			
	14-32	5-15	1.45-1.65	2.0-6.0	0.08-0.12	4.5-6.0	Low	0.17			
	32	---	---	---	---	---	---	----			
Cleveland	0-13	6-20	1.20-1.50	2.0-6.0	0.05-0.10	4.5-6.0	Low	0.17	1	8	.5-8
	13	---	---	---	---	---	---	----			
Rock outcrop.											
BrC	0-6	5-20	1.45-1.65	2.0-6.0	0.10-0.15	4.5-6.5	Low	0.15	5	5	1-5
Brevard	6-65	20-35	1.30-1.40	0.6-2.0	0.15-0.20	4.5-6.0	Low	0.24			
BuB	0-15	3-12	1.60-1.75	>6.0	0.06-0.10	4.5-6.5	Low	0.10	5	2	.5-1
Buncombe	15-65	3-12	1.60-1.75	>6.0	0.03-0.07	4.5-6.5	Low	0.10			
CeB2	0-6	20-35	1.30-1.50	0.6-2.0	0.13-0.15	4.5-6.5	Low	0.28	3	5	.5-1
Cecil	6-58	35-70	1.30-1.50	0.6-2.0	0.13-0.15	4.5-5.5	Low	0.28			
	58-65	20-35	1.30-1.50	0.6-2.0	0.13-0.15	4.5-5.5	Low	0.28			
ChA	0-7	10-27	1.30-1.60	0.6-2.0	0.15-0.24	4.5-6.5	Low	0.28	5	5	1-4
Chewacla	7-21	18-35	1.30-1.60	0.6-2.0	0.12-0.20	4.5-6.5	Low	0.28			
	21-65	18-35	1.30-1.50	0.6-2.0	0.15-0.24	4.5-7.8	Low	0.32			
CxD*:											
Cliffield	0-4	7-20	1.25-1.60	2.0-6.0	0.08-0.13	3.6-5.5	Low	0.15	2	8	1-5
	4-16	10-35	1.20-1.60	0.6-2.0	0.10-0.13	4.5-5.5	Low	0.10			
	16-33	10-35	1.20-1.60	0.6-2.0	0.07-0.09	4.5-5.5	Low	0.10			
	33	---	---	---	---	---	---	----			
Cowee	0-6	8-20	1.25-1.60	2.0-6.0	0.10-0.15	3.6-5.5	Low	0.20	3	5	1-5
	6-25	18-35	1.30-1.60	0.6-2.0	0.12-0.18	3.6-5.5	Low	0.24			
	25-46	---	---	---	---	---	---	----			
	46	---	---	---	---	---	---	----			
DdB	0-11	10-20	1.20-1.50	0.6-2.0	0.12-0.15	5.1-6.0	Low	0.24	4	3	.5-5
Dillard	11-48	18-35	1.40-1.60	0.6-2.0	0.12-0.16	4.5-5.5	Low	0.28			
	48-65	---	---	---	---	---	---	----			
DoB*:											
Dogue	0-6	5-20	1.35-1.50	2.0-6.0	0.08-0.15	3.6-6.5	Low	0.28	5	3	.5-1
	6-58	35-50	1.45-1.60	0.2-0.6	0.12-0.19	3.6-5.5	Moderate	0.28			
	58-62	5-30	1.30-1.50	0.6-6.0	0.05-0.14	3.6-5.5	Low	0.17			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
DoB*:											
Roanoke	0-5	10-27	1.20-1.50	0.6-2.0	0.14-0.20	3.5-6.5	Low	0.37	5	5	.5-2
	5-9	20-35	1.20-1.50	0.6-2.0	0.16-0.19	3.5-5.5	Moderate	0.24			
	9-41	35-60	1.35-1.65	0.06-0.2	0.10-0.19	3.5-5.5	Moderate	0.24			
	41-65	5-50	1.20-1.50	0.06-20	0.04-0.14	3.5-5.5	Moderate	0.24			
EdF*:											
Edneyville	0-3	5-20	1.40-1.60	2.0-6.0	0.11-0.17	4.5-6.0	Low	0.24	5	5	1-8
	3-31	7-20	1.40-1.60	2.0-6.0	0.10-0.16	4.5-6.0	Low	0.20			
	31-65	5-20	1.40-1.60	2.0-6.0	0.08-0.14	4.5-6.0	Low	0.20			
Chestnut	0-3	5-20	1.35-1.60	2.0-6.0	0.10-0.15	4.5-6.0	Low	0.24	3	5	1-8
	3-20	5-25	1.35-1.60	2.0-6.0	0.08-0.12	4.5-6.0	Low	0.15			
	20-25	5-20	1.35-1.60	2.0-6.0	0.08-0.12	4.5-6.0	Low	0.15			
	25-48	---	---	---	---	---	---	---			
	48	---	---	---	---	---	---	---			
EvD*, EvE*, EvF*:											
Evard	0-4	5-20	1.30-1.60	2.0-6.0	0.10-0.14	4.5-6.0	Low	0.24	5	3	1-5
	4-21	18-35	1.30-1.50	0.6-2.0	0.12-0.16	4.5-6.0	Low	0.24			
	21-27	12-30	1.20-1.40	0.6-2.0	0.10-0.25	4.5-6.0	Low	0.24			
	27-65	5-20	1.20-1.40	0.6-2.0	0.08-0.12	4.5-6.0	Low	0.24			
Cowee	0-6	8-20	1.25-1.60	2.0-6.0	0.10-0.15	3.6-5.5	Low	0.20	3	5	1-5
	6-25	18-35	1.30-1.60	0.6-2.0	0.12-0.18	3.6-5.5	Low	0.24			
	25-46	---	---	---	---	---	---	---			
	46	---	---	---	---	---	---	---			
FcD*, FcE*, FcF*:											
Fannin	0-4	5-20	1.30-1.50	2.0-6.0	0.12-0.18	4.5-6.5	Low	0.32	3	5	1-5
	4-34	18-35	1.30-1.50	0.6-2.0	0.11-0.17	4.5-6.5	Low	0.24			
	34-65	5-25	1.30-1.50	0.6-2.0	0.08-0.12	4.5-6.5	Low	0.24			
Cowee	0-6	8-20	1.25-1.60	2.0-6.0	0.10-0.15	3.6-5.5	Low	0.20	3	5	1-5
	6-25	18-35	1.30-1.60	0.6-2.0	0.12-0.18	3.6-5.5	Low	0.24			
	25-46	---	---	---	---	---	---	---			
	46	---	---	---	---	---	---	---			
GrE	0-6	7-20	1.35-1.50	2.0-6.0	0.12-0.16	4.5-6.0	Low	0.32	3	5	.5-2
Grover	6-25	18-35	1.25-1.40	0.6-2.0	0.12-0.14	4.5-6.0	Low	0.32			
	25-65	4-25	1.60-1.70	0.6-2.0	0.10-0.14	4.5-6.0	Low	0.32			
HaC, HaD	0-7	10-20	1.35-1.60	2.0-6.0	0.12-0.20	3.6-6.5	Low	0.20	4	5	1-3
Hayesville	7-21	30-50	1.20-1.35	0.6-2.0	0.15-0.20	3.6-6.0	Low	0.24			
	21-38	20-40	1.30-1.40	0.6-2.0	0.12-0.20	3.6-6.0	Low	0.20			
	38-65	5-25	1.45-1.65	2.0-6.0	0.11-0.15	3.6-6.0	Low	0.17			
HwB2, HwC2	0-7	10-35	1.35-1.55	0.6-2.0	0.12-0.15	4.5-6.5	Low	0.28	5	6	.5-2
Hiwassee	7-58	35-60	1.30-1.45	0.6-2.0	0.12-0.15	4.5-6.5	Low	0.28			
	58-65	20-35	1.30-1.50	0.6-2.0	0.13-0.15	4.5-6.5	Low	0.28			
MaC2, MaD2	0-6	20-35	1.30-1.40	0.6-2.0	0.12-0.16	4.5-6.5	Low	0.28	3	6	.5-2
Madison	6-26	30-50	1.20-1.40	0.6-2.0	0.13-0.18	4.5-5.5	Low	0.32			
	26-37	25-35	1.30-1.40	0.6-2.0	0.12-0.16	4.5-6.0	Low	0.28			
	37-65	5-20	1.30-1.50	0.6-2.0	0.10-0.14	4.5-6.0	Low	0.37			
MsB	0-9	10-20	1.20-1.50	2.0-6.0	0.10-0.17	4.5-6.5	Low	0.32	5	3	1-3
Masada	9-18	20-35	1.30-1.50	0.6-2.0	0.12-0.17	4.5-5.5	Low	0.28			
	18-55	27-55	1.30-1.60	0.6-2.0	0.10-0.17	4.5-5.5	Moderate	0.24			
	55-65	25-40	1.30-1.60	0.6-2.0	0.10-0.17	4.5-5.5	Moderate	0.24			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
OsA	0-11	5-15	1.20-1.40	2.0-6.0	0.06-0.13	4.5-7.3	Low	0.17	3	3	1-3
Ostin	11-22	1-5	1.40-1.60	>6.0	0.02-0.05	4.5-7.3	Low	0.05			
	22-28	1-5	1.40-1.60	>20	0.02-0.05	4.5-7.3	Low	0.10			
	28-60	1-5	1.40-1.60	>20	0.02-0.05	4.5-7.3	Low	0.05			
PaC2, PaD2	0-5	20-35	1.30-1.50	0.6-2.0	0.10-0.14	4.5-6.5	Low	0.24	2	5	.5-1
Pacolet	5-29	35-65	1.30-1.50	0.6-2.0	0.12-0.15	4.5-5.5	Low	0.28			
	29-37	15-30	1.20-1.50	0.6-2.0	0.08-0.15	4.5-5.5	Low	0.28			
	37-65	10-25	1.20-1.50	0.6-2.0	0.08-0.15	4.5-5.5	Low	0.28			
PbC2*, PbD2*:											
Pacolet	0-5	20-35	1.30-1.50	0.6-2.0	0.10-0.14	4.5-6.5	Low	0.24	2	5	.5-1
	5-29	35-65	1.30-1.50	0.6-2.0	0.12-0.15	4.5-5.5	Low	0.28			
	29-37	15-30	1.20-1.50	0.6-2.0	0.08-0.15	4.5-5.5	Low	0.28			
	37-65	10-25	1.20-1.50	0.6-2.0	0.08-0.15	4.5-5.5	Low	0.28			
Bethlehem	0-4	7-20	1.40-1.65	2.0-6.0	0.06-0.10	4.5-6.5	Low	0.15	3	3	1-3
	4-23	35-60	1.25-1.50	0.6-2.0	0.12-0.15	4.5-5.5	Low	0.28			
	23-60	---	---	---	---	---	---	---			
Pt*.											
Pits, quarries											
RnE	0-4	5-20	1.30-1.50	2.0-6.0	0.08-0.12	4.5-5.5	Low	0.24	3	3	.5-2
Rion	4-38	18-35	1.40-1.50	0.6-2.0	0.08-0.15	4.5-5.5	Low	0.20			
	38-65	2-20	1.30-1.50	2.0-6.0	0.06-0.12	4.5-5.5	Low	0.20			
RoF*:											
Rion	0-4	5-20	1.30-1.50	2.0-6.0	0.08-0.12	4.5-5.5	Low	0.24	3	3	.5-2
	4-38	18-35	1.40-1.50	0.6-2.0	0.08-0.15	4.5-5.5	Low	0.20			
	38-65	2-20	1.30-1.50	2.0-6.0	0.06-0.12	4.5-5.5	Low	0.20			
Ashlar	0-5	5-15	1.30-1.55	2.0-6.0	0.04-0.14	4.5-5.5	Low	0.24	2	3	.5-1
	5-24	5-15	1.30-1.55	2.0-6.0	0.04-0.14	4.5-5.5	Low	0.24			
	24	---	---	---	---	---	---	---			
Rock outcrop.											
RtE*:											
Rion	0-4	5-20	1.30-1.50	2.0-6.0	0.08-0.12	4.5-5.5	Low	0.24	3	3	.5-2
	4-38	18-35	1.40-1.50	0.6-2.0	0.08-0.15	4.5-5.5	Low	0.20			
	38-65	2-20	1.30-1.50	2.0-6.0	0.06-0.12	4.5-5.5	Low	0.20			
Cliffside	0-5	7-20	1.30-1.60	2.0-6.0	0.06-0.12	4.5-5.5	Low	0.10	2	3	.5-2
	5-28	10-35	1.25-1.60	0.6-2.0	0.06-0.12	4.5-5.5	Low	0.10			
	28	---	---	---	---	---	---	---			
RvA	0-12	10-27	1.30-1.60	0.6-2.0	0.16-0.24	4.5-6.5	Low	0.32	5	5	.5-2
Riverview	12-60	18-35	1.20-1.40	0.6-2.0	0.15-0.22	4.5-6.0	Low	0.24			
SkB2	0-9	27-35	1.20-1.60	0.6-2.0	0.14-0.20	5.1-6.5	Low	0.28	4	5	1-3
Skyuka	9-52	35-60	1.20-1.50	0.6-2.0	0.14-0.20	5.1-6.5	Moderate	0.28			
	52-60	15-35	1.20-1.60	0.6-2.0	0.13-0.20	5.1-6.5	Low	0.28			
	60-72	10-35	1.25-1.60	0.6-2.0	0.10-0.20	5.1-6.5	Low	0.28			
TaC*, TaD*:											
Tate	0-10	5-20	1.35-1.60	2.0-6.0	0.12-0.15	4.5-5.5	Low	0.17	5	5	1-3
	10-46	18-35	1.30-1.45	0.6-2.0	0.17-0.19	4.5-5.5	Low	0.28			
	46-70	5-25	1.35-1.60	2.0-6.0	0.12-0.15	4.5-5.5	Low	0.17			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
TaC*, TaD*:											
Greenlee	0-11	5-20	1.30-1.50	2.0-6.0	0.06-0.11	3.6-5.5	Low	0.10	5	8	2-5
	11-74	5-25	1.40-1.60	2.0-6.0	0.05-0.10	3.6-5.5	Low	0.10			
TgE*:											
Tate	0-10	5-20	1.35-1.60	2.0-6.0	0.12-0.15	4.5-5.5	Low	0.17	5	5	1-3
	10-46	18-35	1.30-1.45	0.6-2.0	0.17-0.19	4.5-5.5	Low	0.28			
	46-70	5-25	1.35-1.60	2.0-6.0	0.12-0.15	4.5-5.5	Low	0.17			
Greenlee	0-11	5-20	1.30-1.50	2.0-6.0	0.06-0.11	3.6-5.5	Low	0.10	5	8	2-5
	11-74	5-25	1.40-1.60	2.0-6.0	0.05-0.10	3.6-5.5	Low	0.10			
Ud, UoB.											
Udorthents											
WeA	0-13	7-27	1.35-1.60	2.0-6.0	0.10-0.15	4.5-6.5	Low	0.24	5	3	2-5
Wehadkee	13-54	18-35	1.30-1.50	0.6-2.0	0.16-0.20	4.5-6.5	Low	0.32			
	54-74	---	---	---	---	---	---	----			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," and "apparent" are explained in the text. The sy
less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data w
estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Ri
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Unc s
					Ft			In			
ApB Appling	B	None	---	---	>6.0	---	---	>60	---	---	Mod
ArA Arkaqua	C	Occasional	Very brief	Dec-May	1.5-2.0	Apparent	Dec-May	>60	---	Moderate	Hig
AsF*:											
Ashe	B	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Low
Cleveland	C	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Low
Rock outcrop.											
BrC Brevard	B	None	---	---	>6.0	---	---	>60	---	Moderate	Mod
BuB Buncombe	A	Occasional	Very brief	Feb-Jun	>6.0	---	---	>60	---	---	Low
CeB2 Cecil	B	None	---	---	>6.0	---	---	>60	---	---	Hig
ChA Chewacla	C	Occasional	Brief-----	Nov-Apr	0.5-1.5	Apparent	Nov-Apr	>60	---	---	Hig
CxD*:											
Cliffield	B	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Mod
Cowee	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Mod
DdB Dillard	C	Rare	---	---	2.0-3.0	Apparent	Dec-Apr	40-60	---	Moderate	Mod
DoB*:											
Dogue	C	Rare	---	---	1.5-3.0	Apparent	Jan-Mar	>60	---	---	Hig
Roanoke	D	Rare	---	---	0-1.0	Apparent	Nov-May	>60	---	---	Hig
EdF*:											
Edneyville	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low
Chestnut	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Low

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Ri
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Unc s
					Ft			In			
EvD*, EvE*, EvF*:											
Evard	B	None	---	---	>6.0	---	---	>60	---	Moderate	Mod
Cowee	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Mod
FcD*, FcE*, FcF*:											
Fannin	B	None	---	---	>6.0	---	---	>60	---	Moderate	Mod
Cowee	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Mod
GrE Grover	B	None	---	---	>6.0	---	---	>60	---	---	Mod
HaC, HaD Hayesville	B	None	---	---	>6.0	---	---	>60	---	Moderate	Mod
HwB2, HwC2 Hiwassee	B	None	---	---	>6.0	---	---	>60	---	---	Mod
MaC2, MaD2 Madison	B	None	---	---	>6.0	---	---	>60	---	---	Hig
MsB Masada	C	None	---	---	>6.0	---	---	>60	---	---	Hig
OsA Ostin	A	Occasional	Very brief	Dec-Apr	2.0-3.5	Apparent	Jan-Apr	>60	---	Low	Low
PaC2, PaD2 Pacolet	B	None	---	---	>6.0	---	---	>60	---	---	Hig
PbC2*, PbD2*:											
Pacolet	B	None	---	---	>6.0	---	---	>60	---	---	Hig
Bethlehem	B	None	---	---	>6.0	---	---	20-40	Soft	---	Mod
Pt*. Pits, quarries											
RnE Rion	B	None	---	---	>6.0	---	---	>60	---	---	Mod
RoF*:											
Rion	B	None	---	---	>6.0	---	---	>60	---	---	Mod
Ashlar	B	None	---	---	>6.0	---	---	20-40	Hard	---	Low
Rock outcrop.											

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Ri
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		
					Ft			In			
RtE*:											
Rion	B	None	---	---	>6.0	---	---	>60	---	---	Mod
Cliffside	B	None	---	---	>6.0	---	---	20-40	Hard	---	Mod
RvA Riverview	B	Occasional	Brief	Dec-Mar	3.0-5.0	Apparent	Dec-Mar	>60	---	---	Low
SkB2 Skyuka	B	None	---	---	4.0-6.0	---	---	>60	---	---	Hig
TaC*, TaD*, TgE*:											
Tate	B	None	---	---	>6.0	---	---	>60	---	Moderate	Mod
Greenlee	B	None	---	---	>6.0	---	---	>60	---	Low	Low
Ud, UoB. Udorthents											
WeA Wehadkee	D	Frequent	Brief to long.	Nov-Jun	0-1.0	Apparent	Nov-May	>60	---	---	Hig

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX TEST DATA

(Dashes indicate that data were not available. LL means liquid limit; PI, plasticity index; MD, maximum dry density; OM, optimum moisture; and NP, nonplastic. The soils are the typical pedons for the soil series in the survey area. For the location of the pedons, see "Soil Series and Their Morphology" or refer to the footnotes)

Soil name, sample number, horizon, and depth in inches	Classification		Grain-size distribution													Moisture density	
			Percentage passing sieve--								Percentage smaller than--			LL	PI	MD	OM
	Unified	AASHTO	3 in.	1 1/2 in.	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm				
														Pct		Lb/ cu ft	Pct
Bethlehem gravelly coarse sandy loam[1]: (S90NC-149-001)																	
Ap---------- 0-4	SC	A-2-4(0)	100	99	94	84	70	57	43	27	19	14	9	30	10	108.0	16.0
Bt2--------- 8-18	CL	A-7-5(10)	100	100	100	100	100	100	100	67	60	56	47	47	14	96.0	26.0
Cecil sandy clay loam[2]: (S90NC-149-004)																	
Ap---------- 0-6	SC	A-6(5)	100	97	97	96	96	85	74	49	42	37	27	35	17	---	---
Bt1--------- 6-25	CH	A-7-6(16)	100	100	100	100	100	100	100	62	59	58	48	54	28	97.5	23.5
Bt3---------42-58	MH	A-7-5(19)	100	100	100	100	100	100	100	71	61	51	41	63	24	94.5	26.5
Cowee gravelly sandy loam[3]: (S90NC-149-002)																	
A1---------- 0-4	SM	A-2-6(2)	100	99	96	89	82	73	58	29	23	17	11	37	12	---	---
Bt1--------- 6-19	SC	A-2-6(0)	100	100	99	98	96	78	59	31	27	23	18	33	14	112.0	15.5
Grover loam[4]: (S90NC-149-005)																	
A----------- 0-6	MH	A-7-5(14)	100	100	100	100	100	100	100	59	44	31	19	62	24	82.5	29.0
Bt---------- 6-20	MH	A-7-5(12)	100	100	100	100	100	100	100	58	45	33	23	54	23	---	---
C----------25-65	SM	A-5(2)	100	100	100	100	100	100	82	41	25	14	7	50	10	91.0	25.2
Madison sandy clay loam[5]: (S90NC-149-003)																	
Ap---------- 0-6	SC	A-6(4)	100	100	99	99	98	97	77	46	37	31	24	40	16	---	---
Bt1--------- 6-21	MH	A-7-5(22)	100	100	100	100	100	100	100	69	62	52	44	68	29	91.0	27.0
C----------37-65	SM	A-4(0)	100	100	100	100	100	100	72	38	27	19	13	---	NP	98.5	20.5

See footnotes at end of table.

TABLE 16.--ENGINEERING INDEX TEST DATA--Continued

Soil name, sample number, horizon, and depth in inches	Classification		Grain-size distribution												LL	PI	Moisture density	
			Percentage passing sieve--								Percentage smaller than--						MD	OM
	Unified	AASHTO	3 in.	1 1/2 in.	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm					
															Pct		Lb/ cu ft	Pct
Pacolet sandy clay loam[6]: (S90NC-149-006)																		
Ap---------- 0-5	SC	A-4(1)	100	100	100	100	100	100	87	45	34	28	21		26	9	---	---
Bt1--------- 5-20	CL	A-6(8)	100	100	100	100	100	100	100	61	56	51	41		36	17	102.0	20.0
C----------37-65	SM	A-2-4(0)	100	100	100	100	100	100	89	26	17	13	11		---	NP	101.5	17.0

[1] Pedon location: about 0.7 mile northwest of Sandy Plains on North Carolina Highway 9, about 0.8 mile west on Secondary Road 1526, about 200 feet north of the road, in woodland.

[2] Pedon location: about 1.3 miles southeast of Sandy Plains on North Carolina Highway 9, about 0.5 mile southwest on Secondary Road 1521, about 1,000 feet west of the road, in cropland.

[3] Pedon location: about 2.8 miles west of Tryon on Secondary Road 1116, about 100 feet west of the road on a jeep trail, 5 feet south of the trail, in woodland.

[4] Pedon location: about 0.5 mile northwest of Pea Ridge on North Carolina Highway 108, about 0.5 mile north on Secondary Road 1311, about 0.3 mile northeast of Secondary Road 1311 on a logging road, 100 feet southeast, in woodland.

[5] Pedon location: about 5.8 miles north of Mill Spring on North Carolina Highway 108, about 500 feet north of the highway, in woodland.

[6] Pedon location: about 4.7 miles north of Mill Spring on North Carolina Highway 9, about 0.6 mile northeast on Secondary Road 1159, about 600 feet northwest of the road, in an orchard.

TABLE 17.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Appling	Clayey, kaolinitic, thermic Typic Kanhapludults
Arkaqua	Fine-loamy, mixed, mesic Fluvaquentic Dystrochrepts
Ashe	Coarse-loamy, mixed, mesic Typic Dystrochrepts
Ashlar	Coarse-loamy, mixed, thermic Typic Dystrochrepts
Bethlehem	Clayey, kaolinitic, thermic Typic Kanhapludults
Brevard	Fine-loamy, oxidic, mesic Typic Hapludults
Buncombe	Mixed, thermic Typic Udipsamments
Cecil	Clayey, kaolinitic, thermic Typic Kanhapludults
Chestnut	Coarse-loamy, mixed, mesic Typic Dystrochrepts
Chewacla	Fine-loamy, mixed, thermic Fluvaquentic Dystrochrepts
Cleveland	Loamy, mixed, mesic Lithic Dystrochrepts
Cliffield	Loamy-skeletal, mixed, mesic Typic Hapludults
Cliffside	Loamy-skeletal, mixed, thermic Typic Hapludults
Cowee	Fine-loamy, mixed, mesic Typic Hapludults
Dillard	Fine-loamy, mixed, mesic Aquic Hapludults
Dogue	Clayey, mixed, thermic Aquic Hapludults
Edneyville	Coarse-loamy, mixed, mesic Typic Dystrochrepts
Evard	Fine-loamy, oxidic, mesic Typic Hapludults
Fannin	Fine-loamy, micaceous, mesic Typic Hapludults
Greenlee	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Grover	Fine-loamy, micaceous, thermic Typic Hapludults
Hayesville	Clayey, kaolinitic, mesic Typic Kanhapludults
Hiwassee	Clayey, kaolinitic, thermic Typic Kanhapludults
Madison	Clayey, kaolinitic, thermic Typic Kanhapludults
Masada	Clayey, mixed, thermic Typic Hapludults
Ostin	Sandy-skeletal, mixed, mesic Typic Udifluvents
Pacolet	Clayey, kaolinitic, thermic Typic Kanhapludults
Rion	Fine-loamy, mixed, thermic Typic Hapludults
Riverview	Fine-loamy, mixed, thermic Fluventic Dystrochrepts
Roanoke	Clayey, mixed, thermic Typic Endoaquults
Skyuka	Fine, mixed, thermic Ultic Hapludalfs
Tate	Fine-loamy, mixed, mesic Typic Hapludults
Udorthents	Udorthents
Wehadkee	Fine-loamy, mixed, nonacid, thermic Typic Fluvaquents

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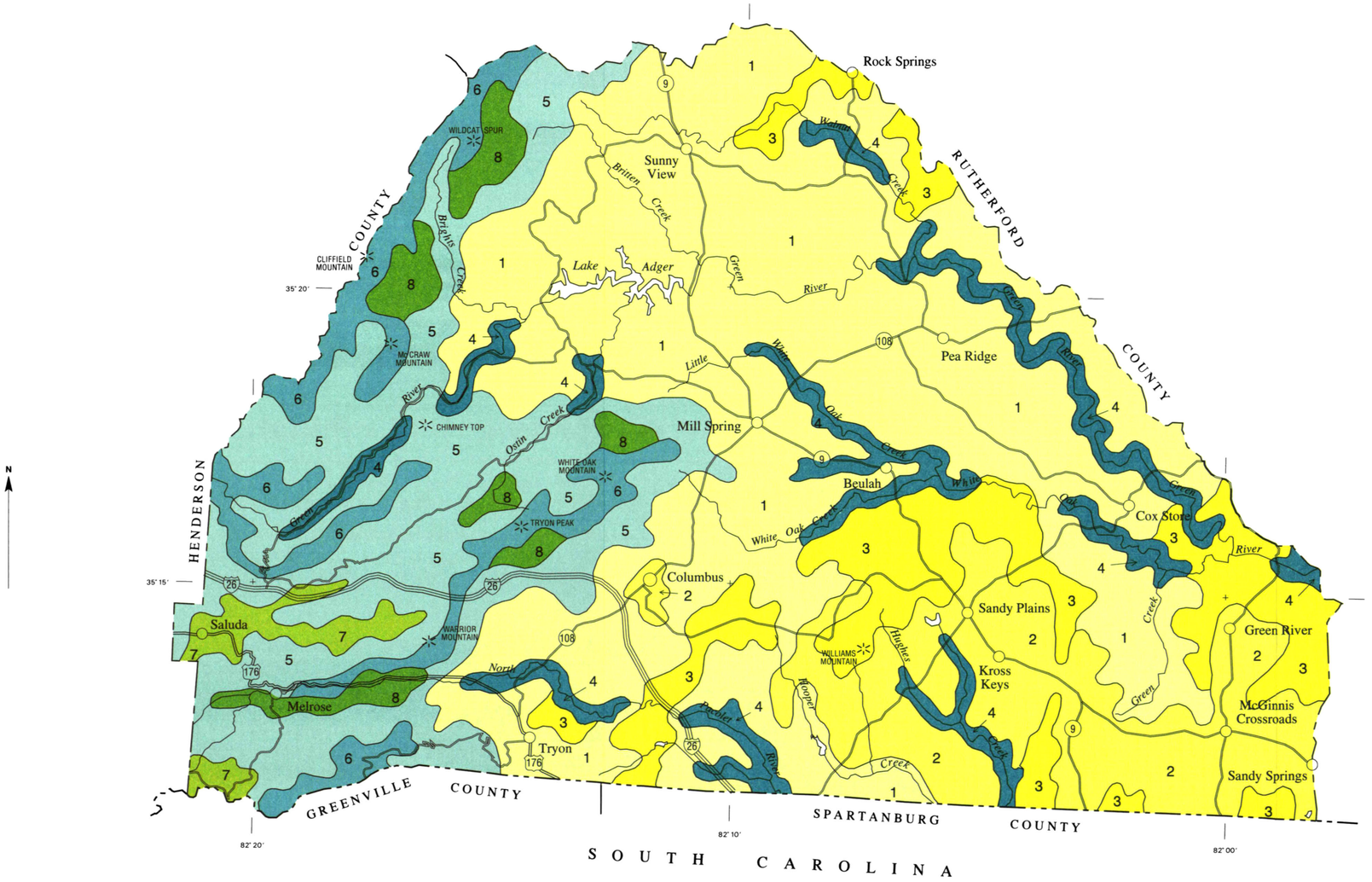


SOIL LEGEND*

GENTLY SLOPING TO STEEP, WELL DRAINED SOILS; ON PIEDMONT UPLANDS

1 Pacolet-Madison-Rion

2 Cecil-Pacolet

3 Pacolet-Bethlehem-Rion

NEARLY LEVEL AND GENTLY SLOPING, SOMEWHAT POORLY DRAINED TO EXCESSIVELY DRAINED SOILS; ON FLOOD PLAINS

4 Riverview-Chewacla-Buncombe

MODERATELY STEEP TO VERY STEEP, WELL DRAINED AND SOMEWHAT EXCESSIVELY DRAINED SOILS; ON MOUNTAIN UPLANDS

5 Evard-Fannin-Cowee

6 Cowee-Cliffield-Ashe-Cleveland

STRONGLY SLOPING AND MODERATELY STEEP, WELL DRAINED SOILS; ON MOUNTAIN UPLANDS

7 Hayesville

STRONGLY SLOPING TO STEEP, WELL DRAINED SOILS; IN MOUNTAIN COVES AND ON FOOT SLOPES

8 Tate-Greenlee

*The units on this legend are described in the text under the heading "General Soil Map Units."

Compiled 1997

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
in cooperation with
NORTH CAROLINA DEPARTMENT OF ENVIRONMENT, HEALTH, AND NATURAL RESOURCES
NORTH CAROLINA AGRICULTURAL RESOURCES SERVICE
NORTH CAROLINA COOPERATIVE EXTENSION SERVICE
POLK SOIL AND WATER CONSERVATION DISTRICT
POLK COUNTY BOARD OF COMMISSIONERS

GENERAL SOIL MAP

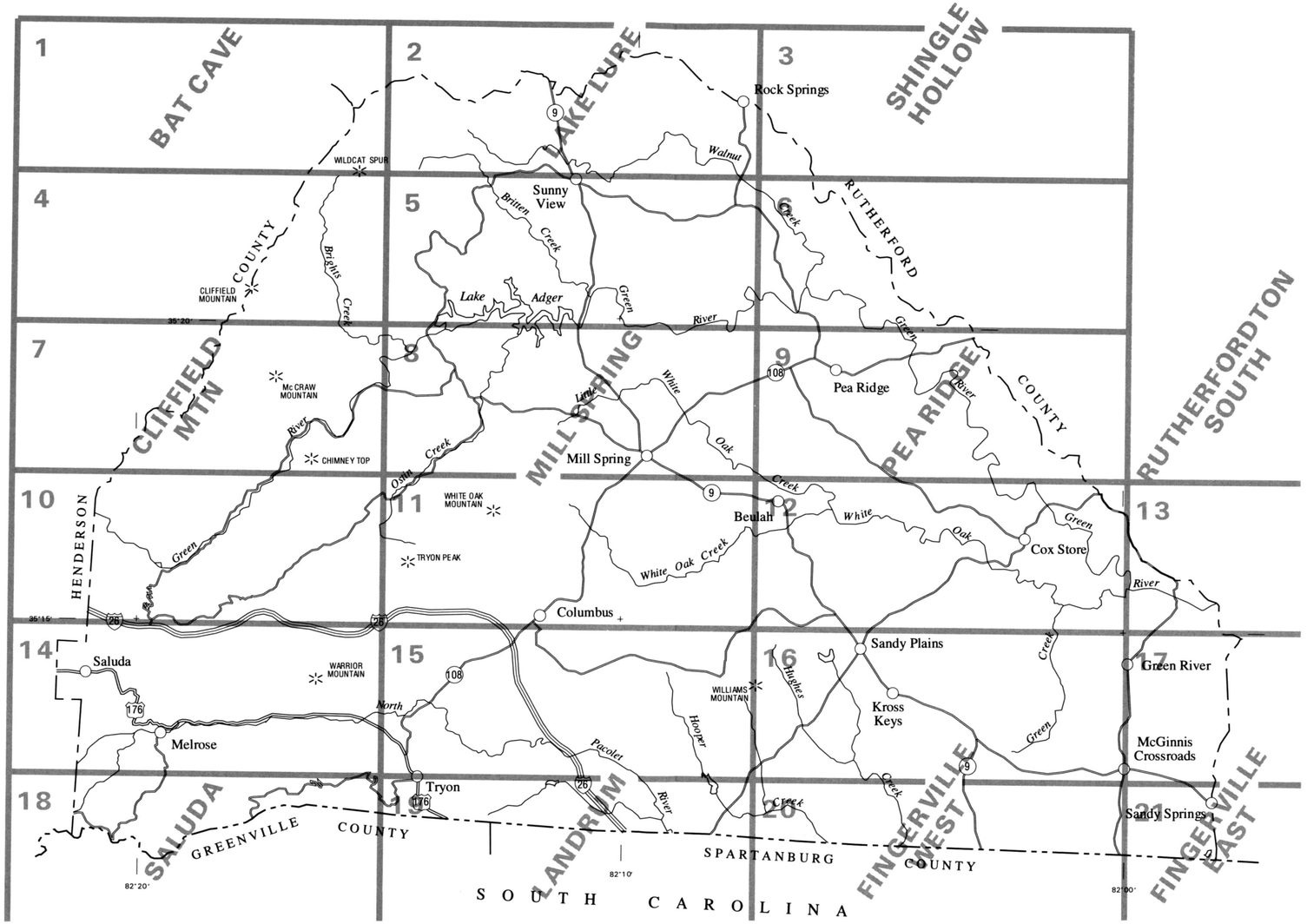
POLK COUNTY, NORTH CAROLINA

Scale 1:126720

1 0 1 2 3
MILES

1 0 1 2 3 4 5 6
KILOMETERS

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



INDEX TO MAP SHEETS

POLK COUNTY, NORTH CAROLINA

Scale 1:126720

1 0 1 2 3

MILES

1 0 1 2 3 4 5 6

KILOMETERS

SOIL LEGEND

Map unit symbols and names are listed in alphabetical order. Map symbols consist of letters or a combination of letters and numbers. The first letter is capitalized and is the letter of the series name (or the name of the higher classification). The second letter is lowercase. The third letter is capitalized and indicates the class of slope. The number 2 at the end of a map unit symbol indicates a moderately eroded phase.

SYMBOL	NAME
ApB	Appling sandy loam, 2 to 6 percent slopes
ArA	Arkaqua loam, 0 to 2 percent slopes, occasionally flooded
AsF	Ashe-Cleveland-Rock outcrop complex, 50 to 95 percent slopes
BrC	Brevard sandy loam, 8 to 15 percent slopes
BuB	Buncombe loamy sand, 0 to 5 percent slopes, occasionally flooded
CeB2	Cecil sandy clay loam, 2 to 8 percent slopes, eroded
ChA	Chewacla loam, 0 to 2 percent slopes, occasionally flooded
CxD	Cliffield-Cowee complex, 15 to 30 percent slopes, very stony
DdB	Dillard sandy loam, 1 to 6 percent slopes, rarely flooded
DoB	Dogue-Roanoke complex, 0 to 6 percent slopes, rarely flooded
EdF	Edneyville-Chestnut complex, 50 to 95 percent slopes, stony
EvD	Evard-Cowee complex, 15 to 30 percent slopes, stony
EvE	Evard-Cowee complex, 30 to 50 percent slopes, stony
EvF	Evard-Cowee complex, 50 to 85 percent slopes, stony
FcD	Fannin-Cowee complex, 15 to 30 percent slopes, stony
FcE	Fannin-Cowee complex, 30 to 50 percent slopes, stony
FcF	Fannin-Cowee complex, 50 to 85 percent slopes, stony
GrE	Grover loam, 25 to 45 percent slopes
HaC	Hayesville fine sandy loam, 8 to 15 percent slopes
HaD	Hayesville fine sandy loam, 15 to 30 percent slopes
HwB2	Hiwassee clay loam, 2 to 8 percent slopes, eroded
HwC2	Hiwassee clay loam, 8 to 15 percent slopes, eroded
MaC2	Madison sandy clay loam, 8 to 15 percent slopes, eroded
MaD2	Madison sandy clay loam, 15 to 25 percent slopes, eroded
MsB	Masada sandy loam, 2 to 8 percent slopes
OsA	Ostin loamy sand, 1 to 3 percent slopes, occasionally flooded
PaC2	Pacolet sandy clay loam, 8 to 15 percent slopes, eroded
PaD2	Pacolet sandy clay loam, 15 to 25 percent slopes, eroded
PbC2	Pacolet-Bethlehem complex, 8 to 15 percent slopes, eroded
PbD2	Pacolet-Bethlehem complex, 15 to 25 percent slopes, eroded
Pt	Pits, quarries
RnE	Rion sandy loam, 25 to 45 percent slopes
RoF	Rion-Ashlar-Rock outcrop complex, 45 to 70 percent slopes
RtE	Rion-Cliffside complex, 25 to 45 percent slopes, very stony
RvA	Riverview loam, 0 to 2 percent slopes, occasionally flooded
SkB2	Skyuka clay loam, 2 to 8 percent slopes, eroded
TaC	Tate-Greenlee complex, 8 to 15 percent slopes, extremely stony
TaD	Tate-Greenlee complex, 15 to 30 percent slopes, extremely stony
TgE	Tate-Greenlee complex, 30 to 60 percent slopes, extremely bouldery
Ud	Udorthents, loamy
UoB	Udorthents, loamy, 0 to 5 percent slopes, rarely flooded
WeA	Wehadkee loam, 0 to 2 percent slopes, frequently flooded

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES
- National, state, or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline and neatline

AD HOC BOUNDARY (label)

Small airport, airfield, park, oilfield, cemetery, or flood pool (FLOOD POOL LINE)

STATE COORDINATE TICK
1 890 000 FEET

LAND DIVISION CORNER (sections and land grants)

ROADS
- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS
- Interstate (173)
- Federal (287)
- State (52)
- County, farm or ranch (1283)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES
- Without road
- With road
- With railroad

DAMS
- Large (to scale)
- Medium or Small (Named where applicable) (water)

PITS
- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES
- Farmstead, house (omit in urban area) (occupied)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (Gas)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE
- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS
- Perennial (water)
- Intermittent

MISCELLANEOUS WATER FEATURES
- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS (TgE EvE)

ESCARPMENTS
- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE (normally not shown)

MISCELLANEOUS
- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

SOIL SURVEY OF POLK COUNTY, NORTH CAROLINA — SHEET NUMBER 1

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POLK COUNTY, NORTH CAROLINA NO. 1

SCALE 1:24 000

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SOIL SURVEY OF POLK COUNTY, NORTH CAROLINA — SHEET NUMBER 2

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

POLK COUNTY, NORTH CAROLINA NO. 2

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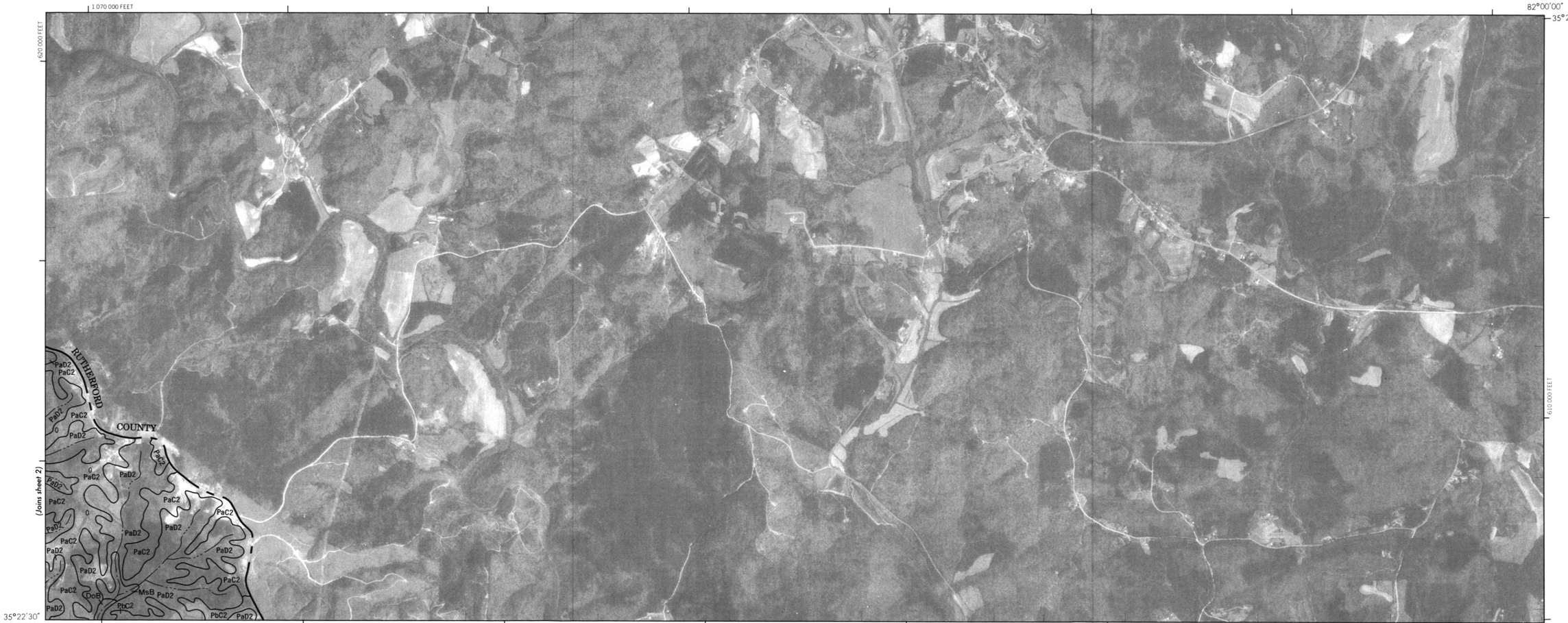
SOIL SURVEY OF POLK COUNTY, NORTH CAROLINA — SHEET NUMBER 3

3

N



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

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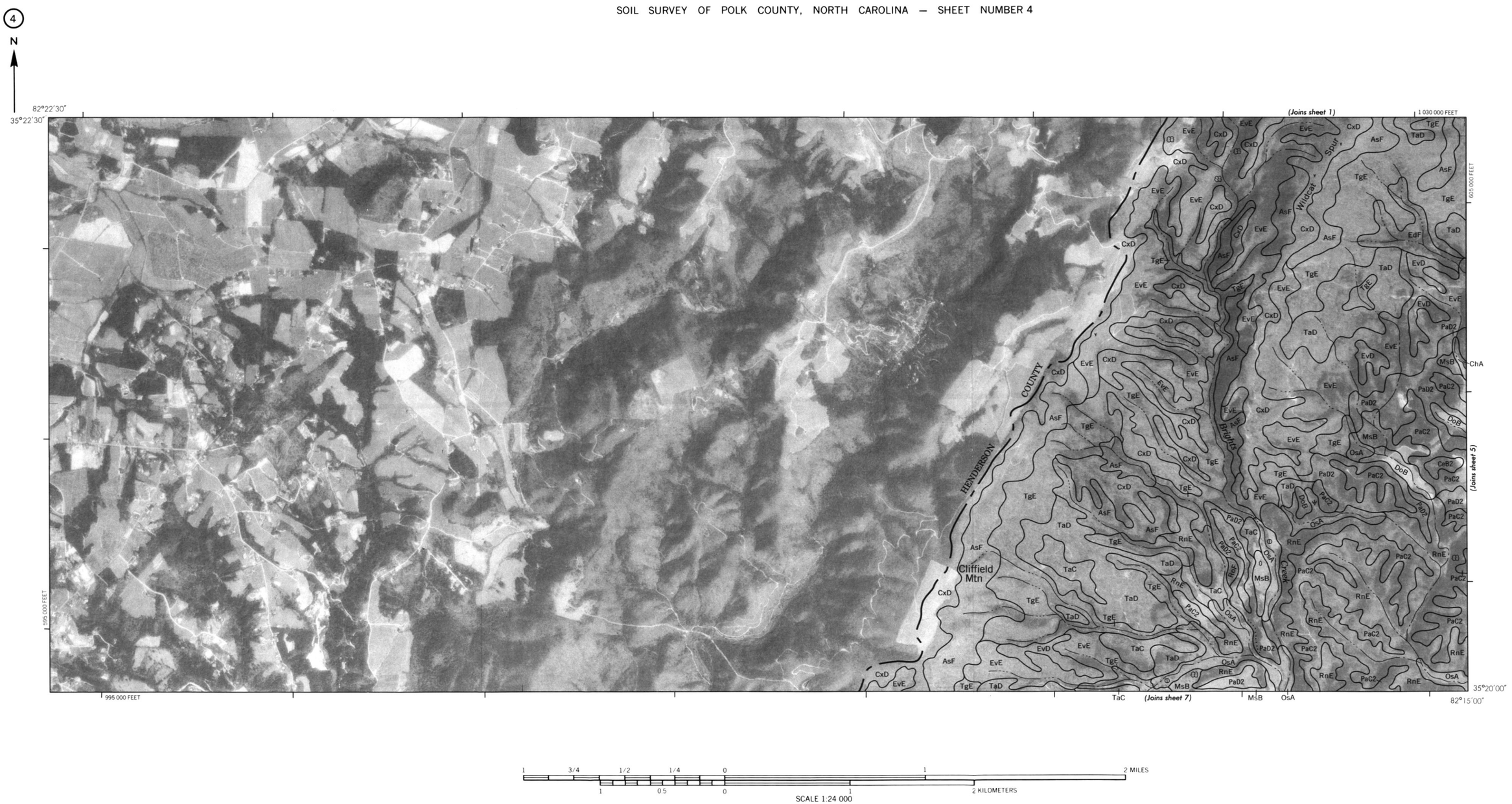
POLK COUNTY, NORTH CAROLINA NO. 3



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

POLK COUNTY, NORTH CAROLINA NO. 4

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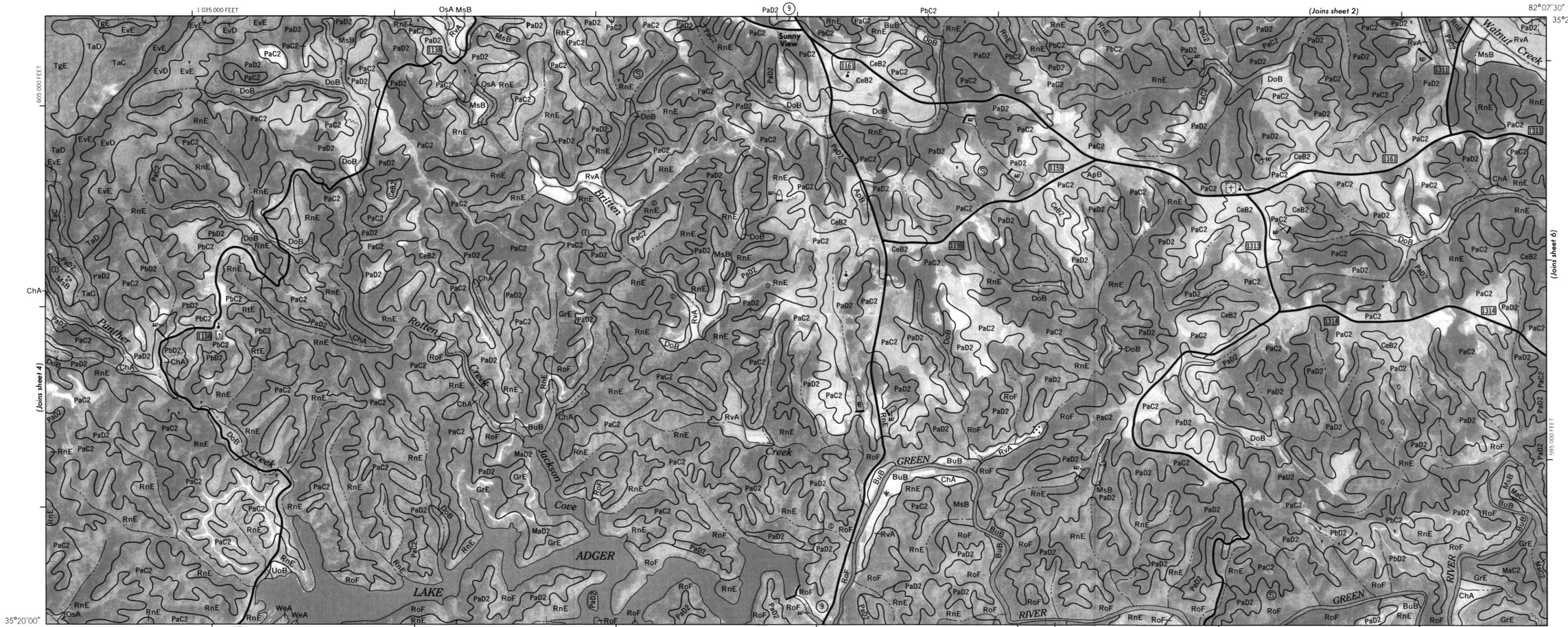
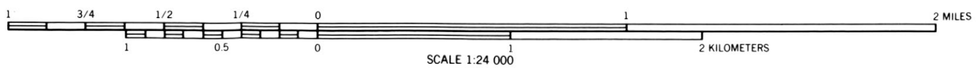
POLK COUNTY, NORTH CAROLINA NO. 5





SCALE 1:24 000

5

N

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

POLK COUNTY, NORTH CAROLINA NO. 6

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POLK COUNTY, NORTH CAROLINA NO. 7

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

POLK COUNTY, NORTH CAROLINA NO. 8

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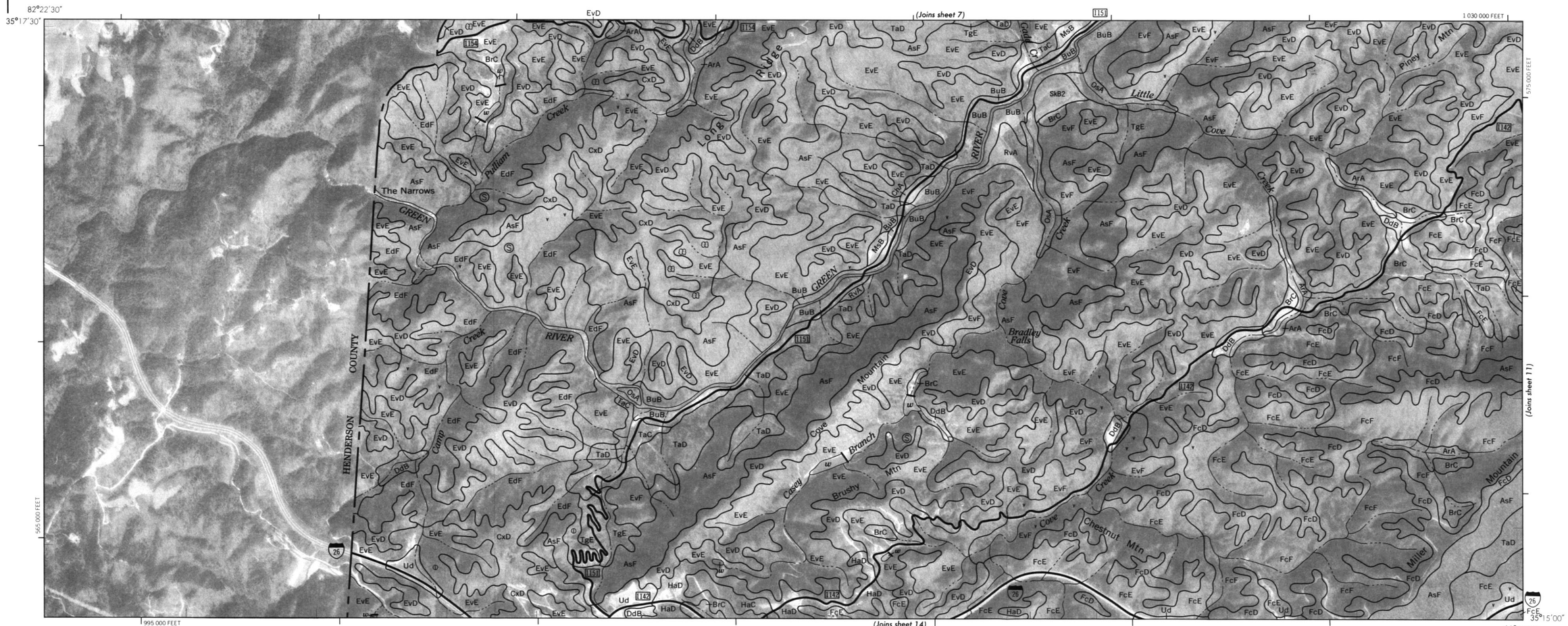
POLK COUNTY, NORTH CAROLINA NO. 9



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

POLK COUNTY, NORTH CAROLINA NO. 10

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POLK COUNTY, NORTH CAROLINA NO. 11

POLK COUNTY, NORTH CAROLINA NO. 12

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1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

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POLK COUNTY, NORTH CAROLINA NO. 13

SOIL SURVEY OF POLK COUNTY, NORTH CAROLINA — SHEET NUMBER 14

1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

POLK COUNTY, NORTH CAROLINA NO. 14

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N

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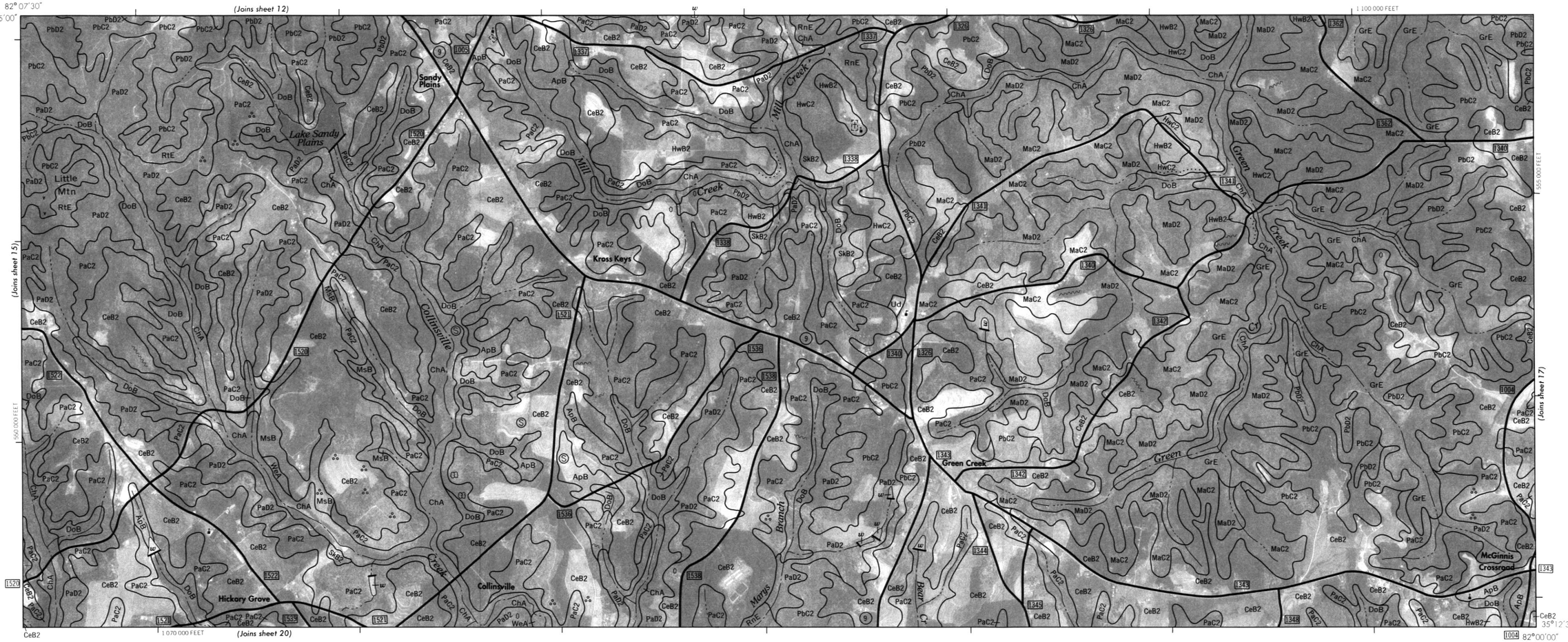
POLK COUNTY, NORTH CAROLINA NO. 15

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000



POLK COUNTY, NORTH CAROLINA NO. 16

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POLK COUNTY, NORTH CAROLINA NO. 17

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

SCALE 1:24 000

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

POLK COUNTY, NORTH CAROLINA NO. 18

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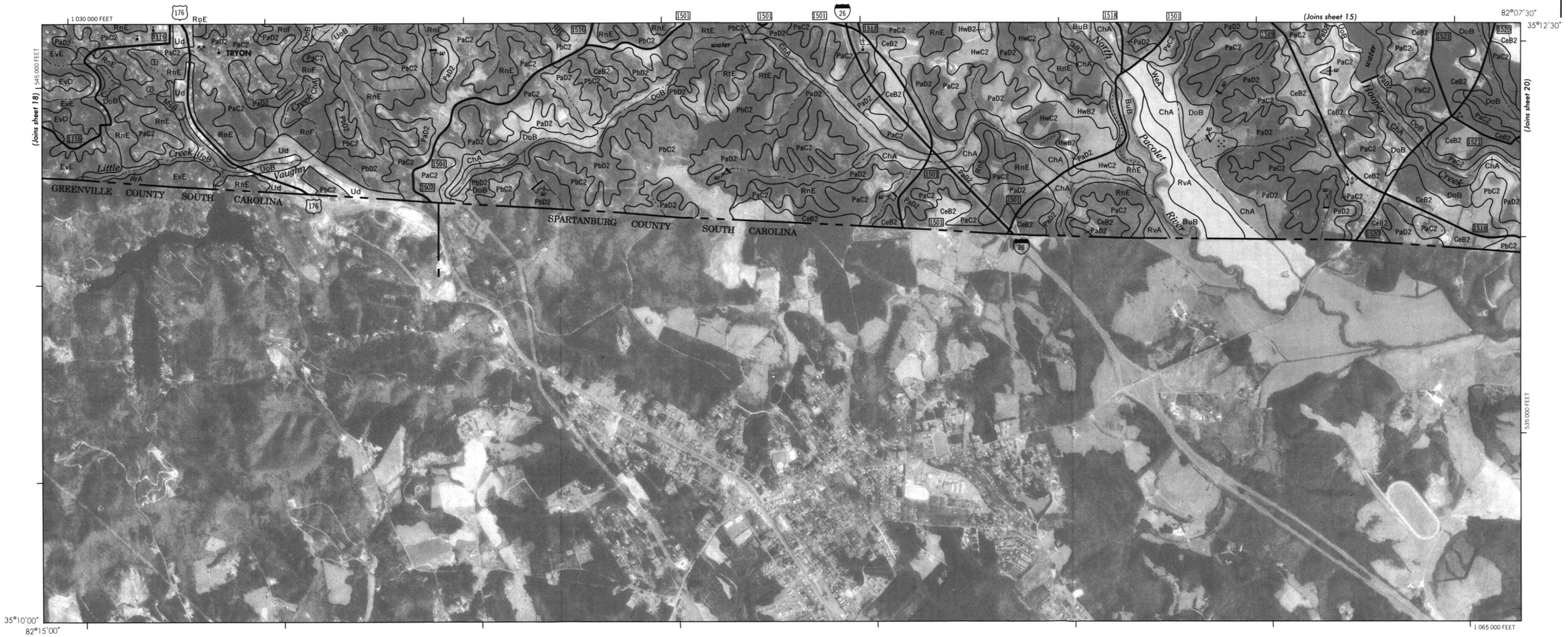

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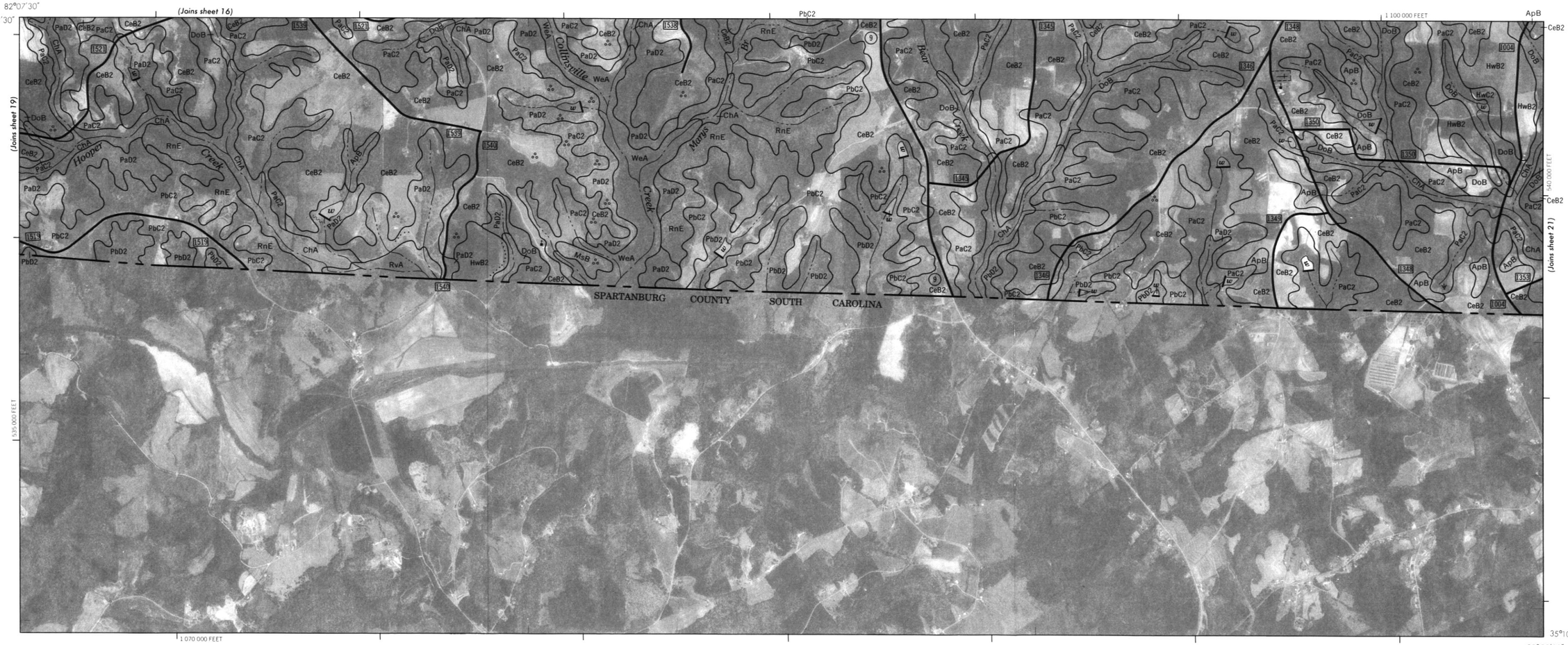
POLK COUNTY, NORTH CAROLINA NO. 19



POLK COUNTY, NORTH CAROLINA NO. 20

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POLK COUNTY, NORTH CAROLINA NO. 21

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000